Atlas of Microorganisms

The Penicillia

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微生物図譜

The Penicillia

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PREFACE

The recent advancement in fundamental and applies microbiology is quite remarkable It is also true the connection that microorganisms have with our lives and daily living is closer and closer Today, as a part of biology, microbiology is just as important as zoology and botany. As a result, it can be said that there is a tendency where the knowledge of the individual species and strains of microorganisms will be gradually as well known as other living things

It is not only of academic interest to classify and identify strains of microorganisms, but it does constitute an important foundation in the theoretical as well as the applies study of microbiology. Especially, after World War II, molds and bacteria have come to play important roles medically as well as industrially, in the output of industrial products, drugs, pharmaceuticalds, and food-stuffs Isolation and indentification of microorganisms have become prerequisites for utilizing them for industrial use

Although numerous research works have been published on the classification and indentification of microorganisms in the past years, a general account of the subject, which can be easily understood and used by teachers and students of microbiology, is lacking Knowledge of microbial genetics and mutation has tremendously advanced in recent years In addition, we now have the powerful new tools, —the electron microscope and colored photography, for studying morphology Therefore, publication of new books or articles on the morphology of microorganisms is very desirable

This atlas, with the foregoing aims, has utilized the latest techniques and describes the morphology of microorganisms, emphsizing the facility it offers not only to professionals but also to other specialists and scholars

This first volumes is by Dr Shigeo Abe on genus Penicillium This genus is one of the most widely distributed mold types in nature Its utilization and effect are deeply related with human life

The author has already published his ten year study of the classification of penicillium species However, this book has been written with a view to diffuse widely his knowledge on the mold penicilia, based on his own studies, but utilizing new techniques

The photographs are printed by the Kanehara Shuppan Co, Ltd whose techniques are widely known

It is believed that the book will contribute greatly to scholars of botany, microbiology, and food technology

University of Tokyo
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序

最近の微生物に関する理論及び応用の学問の進歩はまことに目覚しく微生物と我等の日常生活との結びつきの密接になって来たことも亦昔日の比ではない。今や微生物学は生物学上に於て動物学及び植物学と相並んで重要な地位を占めるに至り，従て微生物の種類に関する知識の如きも生物学の他の両分野に属する生物と等しく一般に広く普及されねばならない気運に立ち至っているものといわねばならない。

各種の微生物を分類し同定することはそれ自体学問上興味深い仕事であるばかりでなくそれは実に微生物学の理論及び応用の重要な基礎をなすものである。ことに応用の面に於ては古くからの微生物の医学上及び産業上に於ける重要性に加うるに第2次大戦後各種工業製品，医薬品，食飼料の生産等えの新たなる応用の面が広く開かれて以来個々の微生物の種又は菌株の検索同定も著しく重要性を加え，微生物分類学の街頭進出の観を呈するに至っているのである。

翻って考うるに微生物の同定，分類に関する研究の発表は年々夥しいものがあるにも拘らずその各部門に於ける綜合的なしかも他の専門に属する研究者又は一般の教育者にも容易に理解し利用し得るような形の著述に至っては必ずしも多いとはいわれない。特に最近の電子顕微鏡写真と着色写真印刷技術との進歩は斯くの如き目的に向かっての絶大な武器ともいうべく微生物の遺伝変異の研究の進歩により旧来の分類に対して書き換え的の変更を必要とさるる点に於ても新たなる著述の強く要望される所以である。

本書は上に述べるような目的を以て最新の技術を利用して特に微生物の形態による検索，同定に重点をおいて編述され専門外の研究者、技術者にも入りやすからしめることを目的としたものである

本書の第1集は阿部重雄君によるペニシリウム属に関するものである。この属は糸状菌のうちでも自然界に最も広く分布するものの一つであって利用，防除の両面に於て人生に深い関係を有するものである

本属の分類に関する著者の十余年にわたる研究は別に発表されて世界の斯学会に重視せられる所であるが本集はその基礎の上に立って前記のような新たなる視野から新たなる目的に添うべく最新の技術を駆使して編述されたものである　金原出版の図版に関する定評ある技術と相俟って世の研究者を益することの多大なるべきを信じて疑わないものである

1957年8月25日　　　坂口謹一郎

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Atlas and descriptions of *Penicillia*

序

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１９５７年８月２５日　　　　坂口謹一郎

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Atlas and descriptions of *Penicillia*.

Introduction

The molds of the genus *Penicillium* have closely participated in our daily life, as can be illustrated with *P. cammemberti* used in the production of Cammembert Cheese, *P. roqueforti* in Roquefort Cheese, or *Citromyces* used in citric acid production, or *P. digitatum* which spoils lemon and orange, *P. expansum* which is responsible for an apple disease, *P islandicum* isolated from diseased rice; and others which contaminate to foods, leathers, clothes, etc

In 1929, Dr A Fleming of England observed that a *Penicillium*, which grew accidentably on the culture plate of *Staphylococcus aureus* caused the lysis of its surrounding cocci cells Thus he discovered for the first time an antibiotic (namely, Penicillin) produced by the pure culture of the molds

Since that time, *Penicillia* have been received keen interests and it has been disclosed that they produce various kinds of antibiotics and large amounts of various useful metabolic products, as will be described later. The first adequate illustration of a mold unquestionably representing a *Penicillium* was given in the 1809 publication of Bulliard and Ventenat, in which *Mucor* penicillatus represented the broom or brush-like forms. The generic name, *Penicillium*, applied to fungi, first appeared in Link's "Observation" (1809), in which he described very briefly the genus and three species. *Penicillium glaucum*, *P. candidum*, and *P expansum*

Wehmer (1893) used the generic name *Citromyces*, and subgeneric Verticillatae, and in 1901 proposed the name *Microaspergillus* He also reported on the physiological and biochemical activities of the *Penicillia* in 1906

Dierckx (1901) described as new 25 species, and proposed a subgenus *Aspergilloides*, for the mono verticillate form

Thom (1906) published "Fungi in Cheese Ripening", and Bainier (1907) proposed the genera *Paecilomyces* and *Scopulariopsis*, Brefeld (1908) proposed the name *Lysipenicillium* and published the life history of *Penicillium glaucum* (1874); Westling (1909) proposed the generic name *Byssochlamys*, he also classified *Eupenicillium* on the basis of the size of conidia and described the *Aspergilloides* in 1911

Sopp (1912) published many figures covering some sixty species of *Penicillium* and proposed the new genera *Acaulium*, *Aspergillopsis*, *Corollium*, *Dactylomyces* and *Styanus* He classified these five on the basis of conidial color and described ten strains of *Aspergilloides*

Biourge (1923) gave a brief Latin diagnosis for some 125 species, and in his Monograph he classified the *Penicillia* on the basis of the character of conidiophores penicillus, conidia, color and color change, etc, and proposed the subgenus *Monoverticillium* In this Monograph, he divided the Penicillia into the two subgenera, *Eupenicillium* and *Monoverticillium* (*Aspergilloides* Dierckx 1901), and divided the former into two sections, Bulliardium or Asymmetrica and Biverticillium Dierckx

(1900); he further divided the first section into six sub-sections, and the second into four series

Zaleski (1927) described 35 new species and one new variety of *Penicillium* from the forest soils of Poland, and he accepted the classification given in Biourge's Monograph, fitting his species into his scheme insofar as possible.

Thom (1930), in his comprehensive Monograph, brought together all of the material on the taxonomy of cultures grown in the laboratory under uniform conditions and emhpasized the importance of observations made on growing colonies and developing conidial structure In this work the genus *Penicillium* was divided into four groups, Monoverticillata, Asymmetrica, Biverticillata-Symmetrica, and *Polyverticillata-Symmetrica*; *Paecilomyces*, *Gliocladium* and *Scopulariopsis* were separated from *Penicillium* but were treated as related genera. Thom described 678 species; the Monoverticillate groups was divided into Monoverticillata-stricta and Monoverticillata-ramigena and the former was divided into four sub-section; the Asymmetrica group was dioivded into six sections, the Velutina into six sub-sections, and the Fasciculata into six sub-sections, the Biverticillata Symmetrica groups was divided into four sections, and the Luteo-viride into two series. In the classification given by Raper, Thom and Fennell in their work, "A Manual of the Penicillia" (1949), all the described species were readjusted and the species named after 1930 were added; a total of 137 species was recognized

The primary basis of separation within the genus *Penicillium* rests upon the pattern and complexity of the conidial structure, or penicillus Raper, Thom and Fennell accepted the divisions used in Thom's classification, and his four major sections

The second basis of separation is whether or not perithecia or sclerotia are produced The third basis of separation is that of colony characteristics The basis of separation within the five sub-sections in the Asymmetrica, rests primarily on the texture and pattern of the surface, or the nature of aerial growth. Sub-sections and series are established upon the following bases: colonies are regarded as velvety, floccose or lanose, funiculose, fasciculate or coremiform in appearance The additional bases of separation are the pigmentation of conidia and the colony reverse, the rate of growth on common laboratory media, and the pattern of mature conidial chains Here again, separation may depend upon the detailed structure of the penicillus, the pattern or character of the sterigmata, the form and markings of the conidiophores, or the shape and dimensions of the conidia By the combination of the criteria described above, forty one series were classified and the major sub-sections were determined in the Asymmetrica In the classification given by Abe (1956), a total of 116 species and varieties are classified In earlier classifications, morphological characters form the chief basis for division but in his report, by the combination of morphological and biochemical characters, a new classification of the genus *Penicillium* was made

(1) ANTIBIOTICS OF *PENICILLIUM*

	Name	Producing Species
1	Penicillin	*P. notatum*, *P. chrysogenum*

2	Albidin	P. albidum.
3	Citrine	P. citrinum.
4	Citromycetin	P. frequentans
5	Clavacin (Clavatin, Claviformin, Expansin, Patulin)	P. patulum, P leucopus, P. claviforme
6	Corylophylin	P. corylophylum.
7	Cyclopaldic acid	P cyclopium
8	Frequentin	P. frequentans.
9	Gentisyl alcohol	P. patulum, P. divergens, P. urticae
10	Gladiolic acid	P gladioli
11	Griseofulvin	P griseofulvum
12	Herquein	P. herquei.
13	Myceliamide	P. griseofulvum.
14.	Mycophenolic acid	P brevi-compactum, P stoloniferum
15	Penatin	P. notatum, P resticulosum, P. corylophylum.
16	Penicidin	Penicillium, sp.
17	Penicillic acid	P puberulum, and others
18	Helenin	P. funiculosum
19	Phenicin or Pheoenicin	P. phoeniceum, P. rubrum
20	Puberulic acid, Puberulonic acid	P puberulum, P aurantio-virens, P. cyclopium, P. viridicatum, P. johannioli
21	Spinulosin	P spinulosum, P cinarescens
22	Tardin	P tardum.
23	Trichocidin	P notatum
24	Xanthocillin	P notatum

(2) PRODUCTS OF *PENICILLIUM*

Name	Producing Species
Citric acid	*P frequentans, Citromyces glaber, Citromyces pfefferianus, P luteum, P citrinum, P glaucum, P arenarium*
Gluconic acid	*P chrysogenum, P luteum purpurogenum*
Fumaric acid	*P grisco-fulvum*
Fumary glycidic acid	*P viniferum*
Iso-citric acid	*P purpurogenum Stoll var rubri-sclerotium, and Others.*
Spiculisporic acid	*P spiculisporum, P crateriform, P minio-luteum.*

γ-ketopentadecic acid	*P. spiculisporum.*
Minioluteic acid	*P. minio-luteum.*
Folic acid	*P. membranaefaciens*
Ergosterol	*P. chrysogenum*
Vitamin B_1, B_2, B_{12}	*Penicillium, sp.*
Amylase, Protease	*Penicillium.*
Pectin	*P. chrysogenum, P. ehrlichii, P. adametzioides.*
i-erythrit	*P. brevi-compactum, P. cyclopium*
Pentosan	*Penicillium, sp*
Mycodextran	*P. expansum.*
Sclerotiose	*P. sclerotiorum.*
Rugulose	*P. rugulosum*
Galactocarolose	*P. charlesii.*
Luteic acid	*P. luteum, P. islandicum.*
Varianose	*P. varians.*
Capreolinose	*P. capreolinum*
Islanditoxin	*P. islandicum.*
Fungisporin	*Penicillium, sp*
Dihydrogladiolic acid	*P. gladioli.*
6-hydroxy-methyl benzoic acid	*P. griseo-fulvum, P. flexuosum*
Mycelianamid	*P. griseo-fulvum*
Gentisyl alcohol	*P. patulum, P. urticae*
Gentisic acid	*P. griseo-fulvum*
3 5-dihydroxylphthalic acid	*P. brevi-compactum*
Mycophenolic acid	*P. stoloniferum P. brevi compactum*
Cyclopaldic acid	*P. cyclopium*
Purpurogenone	*P. purpurogenum*
Citrinin	*P. citrinum*
Citromycetin	*P. frequentans.*
Spinulosin	*P. spinulosum, P. cinerascens*
Phoenicin	*P. phoeniceum, P. rubrum*
Herqueinone	*P. herquei*
Nalgiovensin	*P. nalgiovensis*
Skyrin	*P. islandicum, P. wortmanni*
Rubroskyrin Iridoskyrin Flavoskyrin Erythroskyrin	*P. islandicum*
Rugulosin	*P. rugulosum, P. wortmanni*
Penicilliopsin	*P. clavariaeformis*

Pinselin	*P. amarum*
Stipitatic acid	*P stipitum*
Puberulic acid, Puberulonic acid	*P puberulum, P aurantio-virens*
Terrein	*P. raistickii*
Dehydro carolic acid	*P cinerascens*
Terrestric acid	*P terrestre.*
Penicillic acid	*P. puberulum, P cyclopium*
Viridicatin and cylopenin	*P. cyclopium*
Geodin	*P. estinogenum*
Griseo-fulvin	*P. griseofulvum, P. janczewskii*
Nalgiolaxin	*P nalgiovensis*
Sclerotiorine	*P. sclerotiorum, P multicolor*

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(4) LIST OF ABBREVIATIONS INDICATING THE SOURCE OF CULTURES

ATCC	American Type Culture Collection, Washington, D C.
CBS	Centraalbureau voor Schimmelcultures, Baarn.
CMI	The Commonwealth Mycological Institute Kew, Surrey
IAM	Institute for Applied Microbiology, University of Tokyo
IFO	Institute for Fermentation, Osaka.
Kyowa	Tokyo Research Laboratory, Kyowa Fermentation Industry Co, Ltd, Tokyo
NCTC	*National Collection of Type Cultures, London*
NI	Nagao Institute, Tokyo
NRRL	Northern Utilization Research Branche U S Dept of Agriculture

緒　論

アオカビはカマンベールチーズ製造に用いられる *P. cammanberti*, ロックフォールチーズの *P. roqueforti*, 又クエン酸を作る *Citromyces*, レモン、オレンジに病害を与える *P. digitatum*, リンゴ病害菌の *P. expansum*, 病変米の *P. islandicum* 食品、皮革、衣服等に附着する各種のアオカビ等は我々の日常生活に関係が深い

1929年英国のフレミング博士が *Staphylococcus aureus* の平板培養基上に繁殖したアオカビがその周囲の *S. aureus* を溶かしているのを観察し、このアオカビを純粋培養として抗生物質（ペニシリン）を生産し得る事を発見して以来アオカビは注目され、後述せる如き各種抗生物質を生産し、又色々の代謝産物を作ることが明らかにされてきた。アオカビ（ペニシリウム）についての記述は1809年 Bulliard & Ventenat が、けかび（Mucor）の微細構造はかび [illegible] 完形であると記載したのに始まる。ペニシリウム（アオカビ）属の名称を用い

たのは，*P. glaucum P. candidum, P. expansum,* を記載した 1809 年発刊の Link の "*Observation*" が最初てある。

1893 年 Wehmer は *Citromyces* (現在の *Monoverticillata*) 属名及び Verticillates の亜属名を用い，又 1901 年にて *Microaspergillus* 属名を提唱した。次いて 1906 年ペニシリウムの生化学的機作について報告している。1901 年 Dierckx は 25 の新種を記載し，単輪生状ペニシラスを有する Aspergilloides 亜属を発表した。

1906 年 Thom は "チーズの成熟に於けるカビ" を出版。1907 年 Bainier は現在ペニシリウム類縁菌となっている *Paecilomyces* 及び *Scopulariopsis* 属を設定。1908 年 Brefeld は *Lysipenicillium* 属を提唱し，又 1874 年 *P. glaucum* の生活史を発表した。

1909 年 Westling は *Byssochlamys* 属を設定，1911 年には分生胞子の大きさにて *Eupenicillium* を分類し又 *Aspergilloides* についても報告している。

1912 年 Sopp はペニシリウムの 60 種について図解を行い，又分生胞子の呈色に基ずいて *Acaulium, Aspergillopsis, Corollium, Dactylomyces, Styanus* 各属の設定を行い *Aspergilloides* の 10 株について記載した。

1923 年 Biourage は 125 種を分生胞子柄，ペニシラス，分生胞子，呈色並びに色の変化等の特性にて分類を行い，又 *Monoverticillium* 亜属を設置した。即ちペニシリウム属を *Eupenicillium* と *Monoverticillium* (Dierckx, 1901 年の *Aspergilloides*) の亜属に大別し，前亜属を Bulliardium 或は Asymmetrica と Biverticillium Dierck (1900) の二区に分け，更に前区を 6 亜区に分別した。又後亜属は四つの (series) 組に分けた。

1927 年 Zaleski はポーランドの森林土壌より分離したペニシリウムの 35 新種と一変種を記載し Biourge の分類方式を受け入れた。

1930 年 Thom は均一の条件下て培養を行い，集落の発育，分生胞子構成体の発達を順次観察する重要性を強調し，ペニシリウム属を Monoverticillata, Asymmetrica, Biverticillata Symmetrica, Polyverticillata, の 4 群に大別，*Paecilomyces, Gliocladium, Scopulariopsis* はペニシリウム属の類縁属として分離した。678 種を記載し，単輪生状 (Monoverticillata) 群は純単輪生 (Monoverticillata strict) と分岐単輪生 (Monoverticillata-Ramigena) の二区に分別し，前者は更に四亜区に別けた。不整斉双輪生状群 (Asymmetrica) は 6 区に分け，ビロート状区 (Velutina) は 6 亜区に，束状区 (Fasciculata) は 6 亜区に分別した。整斉双輪生状群 (Biverticillata Symmetrica) は四区に分け，黄緑性区 (Luteo-viride) は更に 2 組 (series) に分別した。

1949 年 Raper, Thom, Fennell 等は "A Manual of the *Penicillia*" を発刊し，1930 年 Thom 報告以後の新種を加えて整理を行い，137 種を確認分類方式を一新した。

ペニシリウム属の分類第一因子は分生胞子構成体，即ちペニシラスの様相又は複雑性に基き Thom の分類方式を踏襲して 4 区に大別した。第二因子として被子器又は菌核形成の有無，第三因子として集落の諸特性を用いた。不整斉双輪生区 (Asymmetrica) の分別は集落の菌叢，表面の様相，或は気生発育の性質に基き，亜区及び組 (series) の分別には次の諸因子に基づいた。即ちビロート状，綿毛状又は羊毛状，縄状，束状或は結束糸状か等の菌叢特性，分生胞子呈色，集落裏面の呈色，各培養基に於ける発育程度，成熟分生胞子連鎖の形状，更にペニシラス微細構成様相，梗子の様相及び特性，分生胞子柄の形及横壁の粗雑度合，分生胞子の形及び大きさ。之等の基準を組合せて 41 組 (series) に分類，不整斉輪生区 (Asymmetrica) にては 5 亜区を設定した。

1956 年阿部は 116 の種又は変種の分類を行い，在来は主に形態的特性にて分別を行っているが，更に之れに生化学的特性を加えて後述の新分類方式を確立した。

ペニシリウムの作る各抗生物質及び代謝産物，及び参考文献，菌株保存機関については英文を読まれたい。

I. Culture Media

A. Media used in earlier studies

1. Raulin's solution
2. Bean Agar and Potato agar
3. Potato-Dextrose agar
4. Licorice sticks.
5. Prune Gelatine
6. *Wort or Beer wort*

B. Media used in the present study.

1) Czapek agar

(Distilled water)	1,000 cc.
$NaNO_3$	3.0 grams
K_2HPO_4	1.0 gram
$MgSO_4 \cdot 7H_2O$	0.5 gram
KCl	0.5 gram
$FeSO_4 \cdot 7H_2O$	0.01 gram
Sucrose (Cube or other good commercial grade)	30.0 grams
Agar	15 to 20 grams

(The pH is nearly neutral and is not adjusted.)

2) Modified Czapek agar (for isolation)

Distilled water	1,000 cc.
$NaNO_3$	2.0 grams
K_2HPO_4	1.0 gram
$MgSO_4 \cdot 7H_2O$	0.5 gram
KCl	0.5 gram
$FeSO_4 \cdot 7H_2O$	0.01 gram
Glucose	10.0 grams
Agar	30.0 grams

(Adjust pH 4.3 to 4.4 with 0.2 N HCl.)

3) Steep agar Czapek agar plus the addition of 10 gms concentrated corn steep liquor. The pH is adjusted to 7.0 with normal NaOH before sterilization.

4) Malt extract agar

Malt extract (Difco)	20.0 grams
Dextrose	20.0 grams
Peptone	1.0 gram
Agar	25.0 grams
Distilled water	1.0 liter

The agar is melted in water in the autoclave prior to the addition of the nutrients. The pH is approximately 4.7 and is not adjusted. Using 2.5 percent agar, the medium should set firm

when sterilized in the usual manner. The other methods, 1 kg saccarified malt is dissolved in 5 liters distilled water at about 65°C, filtered, made up to 10 Ballg solution, and adjusted to pH 4.7; 20 to 25 grams agar per liter is added and the medium is sterilized

5) Koji extract agar: 1 kg. Koji is saccharified in about 5 liter distilled water at about 60°C, filtered, made up to 10 Ballg. solution, and adjusted to pH 6.0; 20 gms agar per liter is added and the medium is sterilized

6) Corn meal agar: 50 gms white corn meal (contained in cloth bag) is boiled in one liter distilled water for one half hour, filterd, and made up to original volume; 20 gms agar is added and the medium is sterilized

7) Hay infusion agar: 50 gms decomposing hay is autoclaved in one liter of distilled water for 30 minutes, and filtered. Two gms. K_2HPO_4 and 20 gms. agar per liter of infusion filtrate is added, pH adjusted to 6.2 with HCl and the medium is sterilized.

8) 20 per cent sucrose Czapek: Similar to 1, except 20 per cent sucrose instead of 3 per cent is added The pH is nearly neutral and is not adjusted

9) Sakaguchi and Wang agar: Similar to 1, except 1.5 gms $NaNO_2$ per liter instead of 3.0 gms $NaNO_3$ is added The pH is adjusted to 7.0 with NaOH.

II. Types of cultures

1) Test tube cultures

The preparation of test tube cultures is practically essential in the handling of a Penicillium Inoculation of such tubes is usually made by wire or loop from a selected mass of mycelium or spores In studying specimens as received, or as newly isolated, transfers to test tubes should be made before any other studies are begun.

Such tube cultures, however, cannot be recommended for abservation, (1) the colony area is generally too small and too confined for the development of wholl characteristic cultural patterns; (2) the culture cannot be viewed directly with the low powers of the compound microscope, and (3) portions of the growing colony cannot be carefully selected and easily removed for the preparation of suitable microscopic mounts But, these cultures are useful to have knowledge of generally characteristics cultural patters

2) Plate cultures

a) Spot cultures The type of culture most commonly emplyoyed is based upon the spot inoculation of agar plates with masses of conidia or bits of mycelium from a selected area in the parent culture Where it is desired to establish a specific number of colonies in particular position within the culture plate, it is advisable to suspend the conidia in sterilled water or better still in melted agar, at about 45°C. and then transfer small amounts of the gelled spore suspension to the fresh culture

Such transfers can be made be means of a conventional wire needle or loop Single, two or

more colonies are desirable for purposes of observation and these can be establish in the same manner

b) Slanted plates By using slanted plates one can in a single culture, study the effects of varying depths of agar as this influences the rate of evaporation, the concentration of nutrients, and other factors which markedly effect the rate and pattern of colony growth And this tecknique is convenient in selections screening of many strains by general characteristics

c) Dilution cultures Dilution cultures are extremely useful in certain types of work, particularly the isolation of strains from soil or other natural substrata They are equally useful for separating two or more Penicilli which may be growing in close association as a result of contamination The first of these consists of suspending the inoculum or sample of natural material in a steril water blank and diluting this progressively by the serial transfer of aliquots of specified amount, usually 1 cc, from one to another in a series of similar water blanks Samples are removed from the dilutions selected as problably most suitable and placed in steril petri dishes followed by the addition of a melted agar medium at about 45 °C In cultures developing from such dilution plates it is desirable to have not less than 3 colonies or more than 10 to 12

The second method of preparing dilution cultures consists of adding the inculum or sample to a tube of melted agar and carefully mixing the added material throughout the agar mass By means of a pipette or loop, a small amount of this suspension is then tranfered to a second agar tube, a portion of the second to the third, etc, to secure the desired dilutions of the original sample. The melted agar containing such dilutions is then poured into petri dishes and allowed to solidefy The second method is often equally as satisfactory as the first

d) Streak cultures. For isolating Penicillia from natural materials, or for separating two or more strains growing together in culture, streak plates are often quite satisfactory and are more easily prepared than either of the above types of dilution plates In the preparation of streak cultures care should be taken in selecting the inoculum so that a minimum of extraneous material is included and the streaking process should be continued through a distance sufficient to allow the development of separate colonies

Streak cultures have another important application in the study of natural variation within an unstable strain of Penicillium

e) Single Spore Cultures In the dilution method as described above, such a percentage actually develops from single cells can be determined by comparing the number of developing colonies with the haemocytometer count of conidia present in the original suspension Using such cultures, however, it is impossible to know whether any particular colony developed from a single conidium or from two or more adherent cells

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water containing a detergent, sodium lauryl sulfonate, in a concentration of 1:10,000. Appropriate dilutions of this suspension are then spread evenly over the surface of a carefully filtered nutrient agar. The plates are incubated at a favorable temperature over night and the conidia allowed to germinate. The plates are examined on the following day with a wide field binocular microscope and the positions of isolated germinating cells are marked. These are then carefully checked with a compound microscope using an 8 mm. objective to insure that no ungerminated spores are present in the immediate area of the cells selected for isolation. By means of a micro-scalpel fashioned from thin platinum-iridium wire, a minute block of agar surrounding the selected spore is removed under the low power binocular and transferred to a freash agar plate. The small agar block is then re-examined with the 8 mm objective to insure that the selected spore has been transplanted.

III. Isolation, screening tests and Spot culture

For the isolation of Penicillia from natural materials, dilution and streak cultures are used. Usually spores are transfered to Czapek agar slants from spot colonies in petri dishes grown at 25° or 30°C for 4 to 5 days; the slants are then incubated at 25°C for 5 to 7 days. Similarly strains are selected and groupfied from numerous strains of newly isolated on the basis of colony characters. Continuous monospore culture is then carried on for the all strains, and from these characteristical strains are selected by rigid observation of colony characteristics.

Normal strains, which are found to be the same as when isolated from natural sources by monospore cultures (dilution culture), are used for diagnosis. The diagnostic technique usually employed is spot inoculation of agar plates with masses of conidia from a selected areas of the normal strains grown on Czapek agar slants which have been incubated at 25°C for 5 to 7 days Then, the characteristics as described after are diagnosed from one day to another in cultures, and the correct determination of species be achieved We usually employed three identical plates for each test, with one colony per plate, and these were incubated at 5, 15, 25, 30, 37°C, on various media as described above But, Raper, Thom and Fennell usually employed plates inoculated with three colonies to be generally satisfactory and to offer a degree of uniformity, useful for comparative purposes.

IV. Observation and description

(1) *Colony characteristics*

1 Rate of growth. Colony diameter after 5 days, 10 to 12 days and 20 to 22 days at various temperatures

2 Colony depth A film of colony and substratum is cut out of the colony center, mounted on a glass slide, and the colony depth is measured at the margins, in the subcentral areas, and in the central area, after 5 to 6 days and 10 to 12 days

3 Texture of colony Examine by naked eye, hand lens and low power of the microscope;

texture are classified as velvety or velutinous, subfloccose or floccose and lanose, funiculose, and fasciculate or coremiform, after Raper, Thom and Fennell's description (1949).

4. Character of surface. The colony surface examined by hand-lens or naked eye, is described as smooth, plane or thin, wrinkled or furrowed, and color of the mycelium, and zonate or azonate characters are noted.

5. Character of margin. The characteristics of the colony margin, such as smooth, compact, mealy or granular, fascicle, thin, narrow, broad, etc., color, and width of the marginal zone are examined by naked eye, hand-lens, and low power of the microscope

6. Colony color and color change Color and shades of conidial areas are classified according to Ridgway's standard after 10 to 12 days and 20 to 22 days In some cases, colors are listed separately for marginal, subcentral, and central areas

Any characteristic color change during growth is also noted

7 Colony reverse: Color and shades of colony reverse are described in the same was as for 6

8 Exudate· Transpiration of fluid is a conspicuous feature, and the presence or absence, amount and color are observed

9 Pigmentation of substratum: Agar pigmentation is a conspicuous feature, and color and shades, width of pigmentation zone after 10 to 12 days and 20 to 22 days, and characteristic color and shades changes during a growth period of 4 to 5 weeks, are described

(2) Microscopic characteristics of conidia formation

Details of structure are observed or measured by direct observation and also by observation of dry mounts or fluid mounts under microscope.

1 Direct observation Data conidial chains and conidiophore lengths, shape of conidial chains, perithecia and sclerotia, number and arrangement of sterigmata, metulae, etc, are obtained by direct observation of the undisturbed colony or slant under the microscope

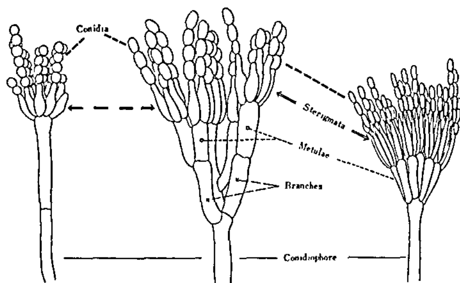
2 Dry mounts Data on size, form and marking of conidia, sterigmata, metulae, branches, conidiophore, sclerotia, perithecia, etc, are obtained by microscopic observation of direct dry mount preparations on glass slides

3 Fluid mounts Small masses of conidial structures are picked from the central, subcentral conidial area, quickly washed in 70% alcohol on a glass slide, then mounted in a special fluid (glycerine, 1 alcohol, 2 water, 3), and sealed with melted paraffin to form a semi-permanent preparation

Data on the diameters of apices and the dimensions of sterigmata, metulae, branches, conidiophores, asci, ascospores, etc, are obtained by observation of fluid mount preparations under the microscope

4 Electron micrograph observations As occasion demands, conidia and other detail structures obtained from Czapek agar cultures, incubated for 22 to 30 days at 25 C are put on a clean 200 mesh copper screen on which a thin "Formvar" (Vinyl acetate formaldehyde polymer)

film or Collodion-SiO film have previously been mounted and dried The specimens are examined with an electron microscope. The electron micrographs are all taken at an electoronic magnification of 2500 or 3000 and then enlarged.



V. Classification of the Genus *PENICILLIUM*

Penicilli consisting of single clusters, or verticils of sterigmata at the tips of fertile hyphae or conidiophores; condiophores usually unbranched, in some forms irregularly branched but with each branch terminating in a distinct and separate monoverticillate penicillus.

. Monoverticillata Section.

Colonies producing perithecia or sclerotia

A. Colonies producing fertile perithecia, but perithecia often ripening late

1 Perithecia firm or sclerotioid at first, ripening from the center outward

a. Penicilli monoverticillate or fragmentary *P. javanicum* series

1 Colonies producing abundant red to reddish brown pigment upon most substrata.

aa Ascospores lenticular, about 2.5 to 3.0 μ in long axis, with equatorial ridges generally lacking and furrow often evident only as line, with walls finely roughened

P. javanicum van Beyma

bb Ascospores lenticular, about 2.0 u in long axis, with prominent equatorial ridges and furrow, with walls roughened.

P. parvum Raper and Fennell.

2 Colonies not producing abundant reddish or reddish brown pigment upon most substrata

aa Ascospores lenticular, about 3.0 to 3.5μ in long axis, with furrow evident but not pronounced with walls finely echinulate, penicilli typically monoverticillate.

. . *P. brefeldianum* Dodge

bb Ascospores lenticular, about 3.5 to 4.0 μ in long axis with walls strongly echinulate and furrow generally pronounced; penicilli reduced or fragmentary

. . *P. ehrlichii* Klebahn

cc Ascospores lenticular, about 4.0 μ in diameter, not furrowed or showing only an equatorial line, with walls smooth; penicilli very reduced, often appearing as single sterigmata

P. levitum Raper and Fennell

b Penicilli typically biverticillate but with monoverticillate structures produced, and with perithecia at first sclerotioid and ripening late

Carpenteles series (in the Divaricata)

-2 Perithecia soft, loose-textured, without a definite or firm outer wall; penicilli commonly fragmentary, often appearing monoverticillate

a. Ascospores large, 7.0 to 8.5 μ in long axis, broadly elliptical, with 5 to 8 prominent longitudinal flanges or ridges showing in side view, without definite equatorial furrow.

P. striatum Raper and Fennell (in *P. luteum* series)

b Ascospores smalls, 2.8 to 3.2 μ in long axis, with a single equatorial ridge or two ridges closely appressed

. *P. stipitatum* Thom (in *P. luteum* series)

B Colonies producing sclerotia, often suggestive of young perithecia but never developing an ascogenous stage

(1) Penicilli strictly monoverticillate

a Sclerotia produced upon all substrates, hard, brittle, crushing with difficulty, composed of thick walled sclerenchyma-like cells

P. thomii series

1) Colonies on Czapek agar seldom developing dull, dark purple colors in reverse.

1 Sclerotia colorless or nearly so, borne in small clusters surrounded by conspicuous envelopes of bright orange-red mycelium

P. sclerotiorum van Beyma

2 Sclerotia in flesh to pink shades, but in clusters and not embeded in masses of orange-red hyphae

a Colonies typically in gray-green shades, colonies growing restricted

P. thomii Maire

b Colonies typically in bright yellow green shades, colonies growing rather broadly

P. thomii Maire var. *flavescens* Abe

3 Sclerotia in orange-brown shades, not in clusters, often surrounded by loose network of yellow to orange or light brown mycelium

P. lapidosum Raper and Fennell

2) Colonies on Czapek agar developing dull, dark purple colors in reverse; sclerotia in light pinkish-brown shades, colonies rather restricted; mycelium in grayish vinaceous or brownish shades.

. . *P. cinnamopurpureum* Abe.

b. Sclerotia produced upon some substrata, not on others including Czapek, comparatively soft, composed of pseudo-parenchymatous cells with walls thickened.

.. .. .*P. turbatum* sub-series

1. Colonies on Czopek agar not developing dull, dark purple colors in reverse, somewhat restricted.

.. . .. *P. turbatum* Westling

2 Colonies on Czapek agar developing dull, dark purple colors in reverse, very restricted

. ...*P. pusillum* Smith.

(2) Penicilli typically biverticillate-asymmetrica.

.. .. *P. raistrickii* series (in the Divaricata).

2. Colonies not producing perithecia or sclerotia

(A Conidiophores generally unbranched and bearing single, strictly monoverticillate penicilli.

1). Conidia globose to subglobose. . ... .*Monoglobosa* series

A) Conidia conspicuously rough-walled

1) Colonies generally spreading broadly on most media, growing at 5°C.

1. Conidia conspicuously verruculose or echinulate, reverse in reddish or brownish shades, colonies velutinous

. . *P. purpurrescens* (Sopp) Raper, Thom and Fennell

2. Conidia spinulose, reverse in colorless to pale yellow or pale pinkish shades and sometimes in purplish or violet shades, colonies velvety or velutionous or loosely textured. ..... *P. spinulosum* Thom.

2) Colonies growing rather restrictedly upon most media, seldom growing at 5°C.

a Seldom growing on Sakaguchi & Wang agar.

1 Conidia conspicuously echinulate, reverse in vinaceous lilac to yellow shades, colonies funiculose. *P. lilacino-echinulatum* Abe.

b Growing on Sakaguchi & Wang agar.

2 Conidia echinulate or granular, conidial area dull gray or smoke gray shades, reverse in dull yellow shades, colonies floccose

P. restrictum Gilman and Abbott.

3 Conidia conspicuously echinulate or tubercles, conidial areas olive green becoming brown shades, reverse colorless or nearly so, colonies floccose.

P. fuscum Sopp Raper, thom Fennel

B) Conidia smooth or slightly rough-walled (Spines less than 0.1 μ)

1) Colonies generally spreading broadly on most media

1. Conidiophores usually more than 100 μ in length, seldom growing Sakaguchi & Wang agar *P. frequentans* Westling

2 Conidiophores very short, colonies funiculose *P. adametzi* Zaleski.

2) Colonies growing rather restrictedly upon most media

a Usually growing on Sakaguchi & Wang agar

1 Colonies quickly developing bright yellow colors in reverse and agar.

i Conidial areas light blue-green or yellow green shades, reverse in bright yellow shades throughout *P citreo-viride* Biourge

ii Conidial areas pale yellow green shades (approaching Sage Green or Vetiver Green), colonies reverse in orange-brown or citrine brown shades in central area *P citreo-viride* Biourge var. *aeneum* Abe.

2 Colonies quickly developing deep vinaceous to purple colors in reverse and agar *P vinaceum* Gilman and Abbott.

b Seldom growing on Sakaguchi & Wang agar.

1 Vegetative mycelium usually pigmented

i. Vegetative mycelium yellow to orange or orange-red, conidiophores mostly more than 60 μ in length, colonies velvety or velutinous *P multicolor* G —M and P.

ii Vegetative mycelium white to pale vinaceous, conidiophores mostly less than 60 μ in length, colonies subfloccose . *P. roseo-purpureum* Dierckx.

2 Vegetative mycelium seldom pigmented, colonies predominantly funiculose *P. terlikowskii* Zaleski

2) Conidia elliptical to ovate or subglobose *Monoelliptica* series

A Conidia conspicuously rough-walled, echinulate or verruculose or (tuberculate) walls in electron microscopy

1) Colonies growing rather rapidly, spreading, colonies growing at 5°C.

1 Conidial areas in blue green or yellow green shades, reverse in deep violet, violet black or dark fuscous shades *P trzebinskii* Zaleski

2 Conidial areas in dull yellow green shades, reverse colorless, conidia usually 4 7 μ or more in length *P trzebinskii* Zaleski var *magnum* Sakaguchi and Abe

3 Conidial areas in blackish green or darkish blue-green shades, reverse in purplish vinaceous or greenish shades, localized, usually strongly vanilla-like odor produced *P trzebinskianum* Abe

2) Colonies growing heavily and restrictedly upon most media, seldom growing at 5°C, conidial areas dark yellow green shades, reverse colorless

2) Colonies on Czapek agar developing dull, dark purple colors in reverse; sclerotia in light pinkish-brown shades, colonies rather restricted; mycelium in grayish vinaceous or brownish shades.

... . *P. cinnamopurpureum* Abe.

b Sclerotia produced upon some substrata, not on others including Czapek, comparatively soft, composed of pseudo-parenchymatous cells with walls thickened

.... *P. turbatum* sub-series

1. Colonies on Czopek agar not developing dull, dark purple colors in reverse, somewhat restricted.

. .. . *P. turbatum* Westling.

2. Colonies on Czapek agar developing dull, dark purple colors in reverse, very restricted.

... . *P. pusillum* Smith.

(2) Penicilli typically biverticillate-asymmetrica.

.. .. *P. raistrickii* series (in the Divaricata).

2. Colonies not producing perithecia or sclerotia

(A Conidiophores generally unbranched and bearing single, strictly monoverticillate penicilli.

1). Conidia globose to subglobose. .. . *Monoglobosa* series

A) Conidia conspicuously rough-walled.

1) Colonies generally spreading broadly on most media, growing at 5°C.

1. Conidia conspicuously verruculose or echinulate, reverse in reddish or brownish shades, colonies velutinous.

.... *P. purpurrescens* (Sopp) Raper, Thom and Fennell

2. Conidia spinulose, reverse in colorless to pale yellow or pale pinkish shades and sometimes in purplish or violet shades, colonies velvety or velutionous or loosely textured .. *P. spinulosum* Thom.

2) Colonies growing rather restrictedly upon most media, seldom growing at 5°C.

a. Seldom growing on Sakaguchi & Wang agar.

1. Conidia conspicuously echinulate, reverse in vinaceous lilac to yellow shades, colonies funiculose. *P. lilacino-echinulatum* Abe.

b Growing on Sakaguchi & Wang agar.

2 Conidia echinulate or granular, conidial area dull gray or smoke gray shades, reverse in dull yellow shades, colonies floccose.

. . .. *P. restrictum* Gilman and Abbott

3 Conidia conspicuously echinulate or tubercles, conidial areas olive green becoming brown shades, reverse colorless or nearly so, colonies floccose.

P. fuscum Sopp Raper, thom Fennel.

B) Conidia smooth or slightly rough-walled. (Spines less than 0.1 μ)

1) Colonies generally spreading broadly on most media.

1. Conidiophores usually more than 100 μ in length, seldom growing Sakaguchi & Wang agar . . . *P. frequentans* Westling

2. Conidiophores very short, colonies funiculose. . . *P. adametzi* Zaleski

2) Colonies growing rather restrictedly upon most media

a. Usually growing on Sakaguchi & Wang agar.

1. Colonies quickly developing bright yellow colors in reverse and agar.

i. Conidial areas light blue-green or yellow green shades, reverse in bright yellow shades throughout. . . *P. citreo-viride* Biourge.

ii. Conidial areas pale yellow green shades (approaching Sage Green or Vetiver Green), colonies reverse in orange-brown or citrine brown shades in central area. . . *P. citreo-viride* Biourge var *acneum* Abe.

2. Colonies quickly developing deep vinaceous to purple colors in reverse and agar. . . . . . *P. vinaceum* Gilman and Abbott.

b. Seldom growing on Sakaguchi & Wang agar

1. Vegetative mycelium usually pigmented

i Vegetative mycelium yellow to orange or orange-red, conidiophores mostly more than 60 μ in length, colonies velvety or velutinous

. *P. multicolor* G. —M and P

ii Vegetative mycelium white to pale vinaceous, conidiophores mostly less than 60 μ in length, colonies subfloccose.

. *P. roseo-purpureum* Dierckx

2 Vegetative mycelium seldom pigmented, colonies predominantly funiculose

P. terlikowskii Zaleski.

2). Conidia elliptical to ovate or subglobose *Monoelliptica* series

A. Conidia conspicuously rough-walled; echinulate or verruculose or (tuberculate) walls in electron microscopy

1) Colonies growing rather rapidly, spreading, colonies growing at 5°C

1 Conidial areas in blue green or yellow green shades, reverse in deep violet, violet black or dark fuscous shades *P trzebinskii Zaleski*

2 Conidial areas in dull yellow green shades, reverse colorless, conidia usually 4.7 μ or more in length

P trzebinskii Zaleski var *magnum* Sakaguchi and Abe

3 Conidial areas in blackish green or darkish blue green shades, reverse in purplish vinaceous or greenish shades, localized, usually strongly vanilla-like odor produced *P trzebinskianum* Abe

2) Colonies growing heavily and restrictedly upon most media, seldom growing at 5°C, conidial areas dark yellow green shades, reverse colorless

. .. *P. fusco-flavum* Abe

B Conidia smooth or slightly rough-walled (Spines less than 0.1 μ)

(1) Colonies growing broadly spreading.

a Growing on Sakaguchi & Wang agar; conidiophores usually more than 350 μ in length

1. Conidia strongly elliptical; colonies in yellow green becoming olive or citrine drab shades, reverse yellow or flesh shades.

. . *P. lividum* Westling.

2 Conidia elliptical to ovate; colonies remaining yellow green in age or tardily becoming light brown in 4 weeks or more, reverse purplish or violet shades becoming yellow shades . . .*P. aurantio-violaceum* Biourge.

b. Seldom growing on Sakaguchi & Wang agar; conidiophores less than 100 μ in length; reverse in vinaceous to redddish shades.

..... *P. chermisinum* Biourge

(2) Colonies growing rather restrictedly upon most media

a. Colonies usually showing strong pigmentation in reverse and agar.

1) Luxuriantly growing on Sakaguchi & Wang agar; reverse and surrounding agar usually strongly pigmented in bright red violet or purplish shades

. . *P phoeniceum* van Beyma.

2) Seldom growing on Sakaguchi & Wang agar.

1. Seldom growing at 5°C or 37°C; conidial areas in deep blue- or bluish gray- or dark yellow green shades; reverse in yellow, orange, reddish, sometimes purplish or violet shades; surrounding agar in bright or pale yellow shades. . . *P. implicatum* Biourge.

2 Growing at 37°C, seldom growing at 5°C; conidial areas in bluish gray green shades; reverse and surrounding agar in orange red or red-brown shades. . . *P. sublateritum* Biourge.

3. Growing at 5 C, seldom growing at 37°C; conidial areas in pale yellow green shades, reverse and surrounding agar in orange or orange brown or pale vinaceous shades *P. adametzioides* Abe

b Colonies usually showing colorless or slight pigmentation in reverse and agar

1) Colonies typically velvety or velutinous; conidial areas in blackish green or dark blue green shades.

1 Luxuriantly growing on Sakaguchi & Wang agar, seldom growing at 37 C, conidial areas blackish yellow green shades reverse colorless or slightly greenish shades in central areas, localized

P decumbens Thom var *atro-virens* Abe

2 Seldom growing on Sakaguchi & Wang agar; growing at 37°C; conidial areas in dark blue green shades, reverse usually in brownish red colors in central areas.

P. fellutanum Biourge var. *nigro-castaneum* Abe

2) Colonies appearing velvety, but usually with surface lightly floccose; colonies seldom in blackish green or dark blue green colors

1 Colonies generally loose textured, consisting of a loose network of interlacing hyphae bearing short conidiophores; reverse colorless, being slightly pinkish or greenish shades *P. decumbens* Thom.

2 Colonies close textured, tough, leathery, with margin compact but showing stolon like hyphae, reverse becoming pale vinaceous or pale yellow shades *P. fellutanum* Biourge

(B Conidiophores mostly branched, occasionally rebranched, each bearing a terminal monoverticillate penicillus but not arranged as a definite apical verticil of metulae (or branchlets) *Ramigena* series

1) Canidia definitely elliptical, and with walls smooth or nearly so

1 Conidia strongly elliptical to narrowly cylindrical (capsule shape), with ends broad, not pointed *P. capsulatum* Raper and Fennell

2 Conidia elliptical and with ends somewhat pointed

P. cyaneum (B and S) Biourge

2) Conidia globose, ovate, or slightly elliptical.

A Colonies growing restrictedly upon most media

1 Conidia globose to subglobose and with walls delicately roughened, in divergent chains, not forming columns *P. waksmani* Zaleski

2. Conidia ovate or slightly elliptical, in parallel chains forming compact columns *P. charlesii* Smith

B Colonies growing rapidly upon most media

1 Conidia globose to subglobose and walls loosely roughened

P. charlesii Smith var *rapidum* Abe

2 Conidia globose to ovate and with walls conspicuously echinulate or verruculose. *P. velutinum* van Beyma

II. Penicilli characteristically once-or twice-branched below the level of the sterigmata, typically asymmetrical, irregular, or one-side; sterigmata not lanceolate

Asymmetrica Section.

(A Penicilli characteristically strongly divaricate, with individual elements strongly divergent often appearing monoverticillate but so arranged as to produce the appearance of a single branched penicillus *Divaricata* Sub-section.

. *P. fusco-flavum* Abe

B. Conidia smooth or slightly rough-walled. (Spines less than 0.1 μ)

(1) Colonies growing broadly spreading

a. Growing on Sakaguchi & Wang agar; conidiophores usually more than 350 μ in length

1. Conidia strongly elliptical; colonies in yellow green becoming olive or citrine drab shades, reverse yellow or flesh shades

. . *P. lividum* Westling

2 Conidia elliptical to ovate; colonies remaining yellow green in age or *tardily becoming light brown in 4 weeks* or more, reverse purplish or violet shades becoming yellow shades *P. aurantio-violaceum* Biourge.

b Seldom growing on Sakaguchi & Wang agar; conidiophores less than 100 μ in length; reverse in vinaceous to redddish shades

. *P. chermisinum* Biourge.

(2) Colonies growing rather restrictedly upon most media

a. Colonies usually showing strong pigmentation in reverse and agar.

1) Luxuriantly growing on Sakaguchi & Wang agar; reverse and surrounding agar usually strongly pigmented in bright red violet or purplish shades

.*P phoeniceum* van Beyma

2) Seldom growing on Sakaguchi & Wang agar.

1 Seldom growing at 5°C or 37°C; conidial areas in deep blue- or bluish gray- or dark yellow green shades; reverse in yellow, orange, reddish, sometimes purplish or violet shades; surrounding agar in bright or pale yellow shades. . . *P. implicatum* Biourge.

2 *Growing at 37°C, seldom growing at 5°C; conidial areas in bluish gray* green shades; reverse and surrounding agar in orange red or red brown shades. .. .*P sublateritum* Biourge.

3. Growing at 5°C, seldom growing at 37°C; conidial areas in pale yellow green shades, reverse and surrounding agar in orange or orange brown *or pale vinaceous shades* *P. adametzioides* Abe.

b Colonies usually showing colorless or slight pigmentation in reverse and agar

1) Colonies typically velvety or velutinous; conidial areas in blackish green or dark blue green shades

1 Luxuriantly growing on Sakaguchi & Wang agar; seldom growing at 37°C, conidial areas blackish yellow green shades, reverse colorless or slightly greenish shades in central areas, localized

. . *P. decumbens* Thom var. *atro-virens* Abe

2 Seldom growing on Sakaguchi & Wang agar; growing at 37°C; conidial areas in dark blue green shades, reverse usually in brownish red colors in central areas

P. fellutanum Biourge var. *nigro-castaneum* Abe.

2) Colonies appearing velvety, but usually with surface lightly floccose; colonies seldom in blackish green or dark blue green colors

1 Colonies generally loose textured, consisting of a loose network of interlacing hyphae bearing short conidiophores, reverse colorless, being slightly pinkish or greenish shades . *P. decumbens* Thom.

2. Colonies close textured, tough, leathery, with margin compact but showing stolon-like hyphae; reverse becoming pale vinaceous or pale yellow shades . *P fellutanum* Biourge

(B Conidiophores mostly branched, occasionally rebranched, each bearing a terminal monoverticillate penicillus but not arranged as a definite apical verticil of metulae (or branchlets) *Ramigena* series.

1) Canidia difinitely elliptical, and with walls smooth or nearly so

1 Conidia strongly elliptical to narrowly cylindrical (capsule-shape), with ends broad, not pointed *P capsulatum* Raper and Fennell

2 Conidia elliptical and with ends somewhat pointed

P. cyaneum (B and S) Biourge.

2) Conidia globose, ovate, or slightly elliptical

A Colonies growing restrictedly upon most media

1 Conidia globose to subglobose and with walls delicately roughened, in divergent chains, not forming columns *P waksmani* Zaleski.

2. Conidia ovate or slightly elliptical, in parallel chains forming compact columns *P charlesii* Smith

B Colonies growing rapidly upon most media

1 Conidia globose to subglobose and walls loosely roughened

P charlesii Smith var *rapidum* Abe

2 Conidia globose to ovate and with walls conspicuously echinulate or verruculose *P velutinum* van Beyma

II Penicilli characteristically once-or twice-branched below the level of the sterigmata, typically asymmetrical, irregular, or one side, sterigmata not lanceolate

Asymmetrica Section.

(A Penicilli characteristically strongly divaricate, with individual elements strongly divergent often appearing monoverticillate but so arranged as to produce the appearance of a single branched penicillus *Divaricata* Sub-section.

1) Colonies producing perithecia, sclerotia, or masses of thick-walled cells.

a. Colonies producing true perithecia, at first parenchymatous throughout, then usually sclerotioid, often ripening late. . . . . *Carpentles* series.

1. Ascospores lenticular, 2.5 to 3.0 μ in long axis, with equatorial furrow prominent and walls roughened. Perithecia light gray to grayish black (when wet), usually ripening in 5 to 6 weeks . . . . . *P. asperum* (Shear) Raper, Thom and Fennell.

2. Ascospores lenticular, 5.0 to 6.0 μ in long axis, equatorial ridges parallel and often closely appressed, with walls rough. Perithecia buff to light tan, commonly ripening in 3 to 4 weeks. . . *P. baarnense* v. Beyma

3. Ascospores lenticular, 2.8 to 3.3 μ in long axis, with equatorial area broad, flattened and usually showing two low, widely separated ridges, with walls smooth. Perithecia in cream to light tan shades, usually ripening in 2 to 3 weeks.

. *P. egyptiacum* v. Beyma

b. Colonies producing sclerotia or masses of thick-walled cells, but apparently not developing asci and ascospores at any stage.

1. Colonies velvety or nearly so upon most substrata, conidiophores arising from the substratum or from aerial hyphae.

.. .. *P. raistrickii* series

a. Conidiophore walls coarsely roughened, sclerotia well organized, firm or stony

1. Sclerotia very hard, stony, white to light pink in color, vegetative mycelium white .... *P. raistrickii* Smith.

2. Sclerotia fairly firm, not sclerotioid, yellow to light brown in color, vegetative mycelium often developing yellow shades from encrustment with yellow granules .. .*P. pulvillorum* Turfitt.

b. Conidiophore walls finely roughened, true sclerotia lacking but small rounded masse of thick-walled cells evident upon all substrata and particularly upon malt agar . . .*P. soppi* Zaleski

c. Conidiophore walls smooth or nearly so

1. White to pink sclerotia reported .. *P. rolfsii* Thom

2. Small masses of heavy-walled cells (as in *P. soppi*) produced in some strains . .. ..*P. miczynskii* Zaleski.

(see *P. janthinellum* series)

2. Conidial areas commonly showing fasciculation, with conidiophores aggregated into more or less well definied bundles or tufts . The Fasciculata.

a. Sclerotia abundantly produced, often characterizing the colony at temperatures above 20°C . , *P. gladioli* Machacek.

b. Sclerotia reported but seldom produced abundantly

, *P. italicum* Wehmer.

2) Colonies not producing perithecia, sclerotia or masses of thick-walled cell

(a Colonies not showing green, gray-green or blue-green with the ripening of conidia

1. Colonies developing lilac, vinaceous or violaceous shades

. *P. lilacinum* series.

1—a. Colony reverse developing vinaceous or purple-red shades

. *P lilacinum* Thom

1—b Colony reverse developing bright yellow shades.

. . *Spicaria violacea* Abbott.

2. Colonies developing pinkish-buff to avellaneous shades.

. ... *P. humuli* van Beyma.

3 Colonies velvety or nearly so, with conidial areas in tan, cream or near-white shades, never showing green. . .. Natural mutants of many species

(b Colonies showing some shades of green, gray, gray green, or blue-green with the ripening of conidia

(1 Penicilli with divaricate character well marked, sterigmata-bearing branchlets (metulae) scattered on the conidiophores, or commonly only partly aggregated into true verticils

-(A Ripe conidia typically in pale blue-green or gray-green shades and colony reverse often highly colored

-(1 Conidial chains strongly divergent and becoming tangled in age, not tending to form columns

a) Sterigmata abruptly tapered to narrow conidium-bearing tubes

. *P janthinellum* series

1) Conidia elliptical, rough with echinulations arranged in spiral or transverse bands *P. daleae* Zaleski

2) Conidia smooth roughened, but with echinulations not arranged in spiral or transverse bands

a Colony reverse and vegetative mycelium often strongly colored (orange-red, reddish purple, etc) in new isolates *P janthinellum* Biourge

b Colony reverse colorless or in yellow to orange shades, vegetative mycelium colorless or light buff to peach shades

(1) Conidiophores roughened

1 Colony reverse colorless or yellow shades, penicilli commonly consisting of a terminal verticil of divergent metulae

P simplicissimum (Oud) Thom

2 Colony reverse near orange shades, penicilli often irregular

P ochro-chloron Biourge.

(2) Conidiophores smooth or nearly so

1 Conidia with conspicuously roughened walls

.. *P. piscarium* Westling

2 Conidia with smooth or nearly so, walls

. . *P miczynskii* Zaleski

-b) Sterigmata not abruptly tapered to conidium-bearing tubes

. . . . *P godlewskii* Zaleski

-(2 Conidial chains tending to form columns, at least in young cultures, conidia globose to subglobose or ovate. . . *P. canescens* series

1. Colony reverse orange red or deep red shades; conidia globose, with smooth, or nearly so, walls. .. *P nalgiovensis* Laxa.

2. Colony reverse and surrounding agar deep red shades, conidia ovate, with echinulate or verruculose walls . . *P echinulo-nalgiovense* Abe.

3 *Colony reverse orange becoming rich brown shades; conidia globose with smooth* or slightly roughened walls. . *P. canescens* Sopp.

4. Colony reverse colorless or in dull peach or yellow seades, not developing dark colors; conidia globose with delicately echinulate walls

. . *P. jenseni* Zaleski.

-(B Ripe conidia typically in dull gray shades such as steel gray to dark olive gray (Ridgway), globose; colony reverse usually in yellow to deep orange shades.

.. *P nigricans* series

1) Conidiophore walls smooth or nearly so on all substrata

A. Conidia strongly aculeate or echinulate.

1. Colonies developing dull to dark gray shades; rather restrictedly

P nigricans (Bainier) Thom.

2 Colonies developing dull to gray-green shades; growing ratheh rapidly

. . *P nigricans* (Bainier) Thom var *sulfuratum* Abe

3. Colonies white or nearly so; light sporulating, floccose.

P. albidum Sopp

B Conidia delicately echinulate. . *P. kapuscinskii* Zaleski

2) Conidiophore walls coarsely roughened, at least on malt agar

1 Conidia aculeate . . *P. melinii* Thom

2 Conidia smooth or nearly so *P raciborskii* Zaleski

(2 Penicilli with divaricata character evident, but tending toward compactly biverticillate with metulae usually borne at a single level and conidia producing compact columns that are typically divergent *P citrinum* series

(B Penicilli seldom strongly divaricate, usually compact, with branches and metulae tending to be parallel rather than divergent

(1) Colonies typically velvety, with conidiophores arising characteristically from the substratum in a dense even stand Velutina Sub-section.

(1 Penicilli seldom branched below the level of metulae, with metulae often more or less divergent, seldom growing at 5°C and 37°C, usually growing on Sakaguchi & Wang agar .. ..*P. citrinum* series

a Conidia globose to subglobose

1 Colonies showing bright yellow to orange pink shades in exudate or reverse and surrounding agar, penicilli suggesting a symmetrical pattern . . . *P citrinum* Thom.

2 Colonies showing dull yellow to olive buff shades in reverse, sometimes light brown shades; penicilli suggesting divaricate and somewhat irregular pattern . *P. steckii* Zaleski

3 Colonies quickly becoming greenish olive or dark green shades in reverse on Czapek, steep or Koji-extract agar; penicilli mostly suggesting symmetrical pattern. *P. citreo-virens* Abe

b Conidia elliptical to subglobose

1 Usually unequal in length of metulae, 2 to 3 or occasionally 5 verticils; colony reverse in light brown or fuscous shades *P corylophilum* Dierckx.

2 Usually unequal in length of metulae, 5 to 8 verticils, colony reverse in colorless or pale yellow shades. . *P. corylophiloides* Abe

3 Usually equal in length of metulae, 5 to 8 verticils, and closely compact; colony reverse in dull yellow shades *P paxilli* Bainier.

(2 Penicilli typically rebranched below the level of metulae, with main axes and branches terminating in verticils of metulae, usually growing at 5°C

A) Penicilli commonly long, with elements loosely arranged and often divergent

1) Conidiophores smooth walled or nearly so

1) Conidia less than 4.5 μ in long axis, conidial chains often adherent into well-defined columns *P chrysogenum* series

a Conidia elliptical to ovate, occasionally subglobose.

a—1 Seldom growing on Sakaguchi & Wang agar, conidia usually more than 3.0 μ in long axis

1 Colonies usually showing abundant yellow exudate and yellow pigmentation in reverse and surrounding agar *P. chrysogenum* Thom

Tan mutant *P chrysogenum* Thom mut *fulvescens* Takashima, Arima and Abe

2 Colonies showing pale or colorless exudate and surrounding agar, brownish colors throughout in reverse *P meleagrinum* Biourge

a—2 Luxuriantly growing on Sakaguchi & Wang agar, conidia usually less than 3.0 μ in long axis conidial areas quickly dull green shades

P meleagrinum Biourge var *viridi flavum* Abe

b. Conidia globose to subglobose; seldom growing on Sakaguchi & Wang agar.

1. Agar surrounding colonies usually broadly yellow pigmented; exudate bright yellow color .. . *P. notatum* Westling.

2 Agar surrounding colonies usually colorless; exudate colorless or tardily pigmented . . . *P. cyanco-fulvum* Biourge.

2) Conidia commonly 4 5 μ or more in long axis, strongly elliptical.

a Conidia elliptical, fairly uniform in size. . *P. oxalicum* series

a—1. Luxuriantly growing at 37°C, colonies plane or nearly so, conidia often forming deep crusts. .. . *P. oxalicum* Currie and Thom.

a—2. Seldom growing at 37°C; colonies radially furrowed, not forming deep crusts, reverse in reddish to maroon shades ... .. *P. atramentosum* Thom

b. Conidia strongly cylindrical to elliptical varying greatly in size and often very large; penicilli very irregular, often fragmentary.

..... , *P. digitatum* series

b—1. Colonies rather restrictedly spreading, conidial areas dull yellow green shades. . . . *P. digitutum* Saccardo.

b—2 Colonies rather broadly spreading, conidial areas blue-green shades . . *P. digitatum* Saccardo *var. latum* Abe

b—3 Conidia white, otherwise duplicating the species.

.... *P. digitatum* Sacc. var. *californicum* Thom

2) Conidiophores typically rough-walled . ....*P. roqueforti* series.

a Conidia globose rarely subglobose, colonies usually plane or slightly furrowed on Czapek agar

a—1. Conidia smooth walled or nearly so; conidiophore walls with protuberances or larger granules (about 0 6 to 1 0 μ in length), luxuriantly growing on Saka guchi & Wang agar, margin thin and often arachnoid

. . . *P. roqueforti* Thom

a—1. Conidia delicately echinulate or verruculose walled, conidiophores walls punctate or smaller granules; poorly growing on Sakaguchi & Wang agar; rather compact, seldsm producing arachnoid margin

P. roqueforti Thom var. *punctatum* Abe

b Conidia elliptical or ovate to subglobose; usually radially furrowed.

b -1 Seldom growing on Sakaguchi & Wang agar.

1 Conidia elliptical to subglobose, smooth walled or nearly so; reverse and surrounding agar usually strongly pigmented .. . *P. casei* Staub

2 Conidia ovate to subglobose with spinulose walls; reverse in vinaceous pink shades, surrounding agar milky-like pigment; penicilli suggestive of the *P. brevi-compctum* series .. . . *P. casei* Staub var. *compactum* Abe

b-2 Luxuriantly growing on Sakaguchi & Wang agar, conidia elliptical to ovate with delicately echinulate or verruculose walls, reverse and surrounding agar colorless or pale yellow shades . . *P pseudo-casei* Abe

B) Penicilli comparatively short, compact, with all elements closely pressed *P. brevi-compactum* series

1 Conidia globose to subglobose; branches and metulae commonly inflated *P brevi-compactum* Dierckx

2 Conidia elliptical to subglobose, with echinulate or verruculose walls; colonies in yellow green shades *P stoloniferum* Thom

3. Conidia elliptical to subglobose, with echinulate or verruculose walls; colonies in brownish shades *P. brunneo-stoloniferum* Abe.

(2) Colonies typically lanose or floccose, without evidence of fascicles or ropes of hyphae, or with such structures reduced and inconspicuous if present . Lanata Sub-section.

A Colonies predominantly white, remaining so, with the development of ripe conidia or becoming lightly colored in gray-green shades

P camemberti series

1 Colonies remaining white indefinitely . . *P. caseicolum* Bainier

2 Colonies with surface becoming pale gray-green or greenish glaucous within 10 to 14 days *P camemberti* Thom

B Colonies quickly developing some shade of green in conidial areas.

P. commune series

1) Vegetative mycelium uncolored and with reverse uncolored or in drab shades, usually heavily sporing on malt agar

a Conidia globose or nearly so, less than 4.0 u in diameter, finely roughened *P lanosum* Westling

b Conidia elliptical or in age becoming subglobose, commonly up to 4.0 u or more in diameter, smooth-walled

1 Conidial areas in rather bright yellow-green shades.

P lanoso-viride Thom

2 Conidial areas bluish green to gray-green

a Conidial areas with blue element pronounced, near bluish glaucous, deeply floccose *P lanoso-coeruleum* Thom

3 Conidial areas with green to gray-green shades predominating, at first court gray to gnaphalium green, becoming olive in age

a Colonies with unusually strong actinomyces like odor

P biforme Thom

b Colonies with odor less pronounced

1 Colonies forming a felt 300 to 1000 u deep

. . . *P commune* Thom

2 Colonies deeply floccose, 1 to 2 mm deep

.. . ..*P. lanoso-griseum* Thom

2) Vegetative mycelim yellow to orange, at least adjacent to the substratum; reverse orange to bay; non-sporulating or very lightly sporulating on malt agar.

a Colonies deep, 2 0 to 3 0 mm, loosely floccose, lightly sproulating upon Czapek and steep agar. . . . *P. aurantio-candidm* Dierckx

b Colonies thinner, definitely fasciculate, usually heavily sporing on Czapek and steep agars . . *P aurantio-virens* Biourge (in *P. viridi-cyclopium* Series

(3) Colonies with surface typically ropy or funiculose from aggregation of aerial hyphae; conidial structures arising primarily from aerial hyphae or ropes of hyphae.

.. . **Funiculosa Sub-section**

1) Conidial areas in definite yellow-green, blue-green, or gray-green shades; penicilli large, representing the same type as seen in the Lanata and Fasciculata sections; conidiophore walls more or less roughened, but metulae and sterigmata smooth.

.. .. .*P. terrestre* series

A Colonies with reverse uncolored or in pale yellow to drab shades.

1. Conidia in bright yellow-green shades . *P psittacinum* Thom

2 Conidia in dull gray-green shades, with conidiophores usually conspicuously roughened

. . *P terrestre* Jensen

3 Conidia in blue-green shades, with conidiophores smooth or nearly so.

, .. *P. solitum* Westling

B Colonies deeply colored in reverse, in reddish to dark brown shades

P. resticulosum Birk, Raist, and Smith

2) Conidial areas variously colored, not in green shades, penicilli often comparatively narrow with cellular elements laterally compressed; walls of conidiophores, metulae (and often the sterigmata) are closely and conspicuously roughened

. .. . *P pallidm* series

A Conidia white to cream colored

1 Conidial chains divergent, becoming tangled in age

P. pallidum Smith

2 Conidial chains in well-defined columns. *P putterilli* Thom

B Conidia in light to dull gray shades. . *P. namyslowskii* Zaleski

C Conidia in light violet, lavender, or vinaceous shades

P. lavendulum Raper and Fennell

(4) Colonies with surface growth appearing mealy, tufted, fasciculate, or coremiform due to aggregation of conidiophores into upright fascicles or bundles

Fasciculata Sub-section

a Sclerotia characteristically produced

1 Sclerotia abundantly produced at 25-30°C, less abundantly at lower temperatures; conidiophore walls roughened . . *P gladioli* series, *P gladioli* Machacek

2 Sclerotia or perithecia produced in occasional strains or under special conditions; conidiophores walls smooth.

. *P. italicum* Wehmer

b Sclerotia not produced

(A. Colonies with simple conidiophores and fascicles intermixed, but with simple conidiophores usually predominating.

(1 Colonies lacking true green colors in areas of ripe conidia

P. ochraceum series

1 Conidial areas in yellowish olive, buffy olive or buffy brown shades

P. ochraceum (Bainier) Thom

2 Conidial areas in lighter shades near sandy brown or pinkish buff.

P carneo-lutescens Smith

3 Conidial areas colorless or in light cream shades.

. Color mutants of *P claviforme* and *P. urticae* and other species

(2. Colonies characteristically developing yellow-green, blue green or gray green shades in areas of ripe conidia; seldom growing at 37°C

1) Conidiophores usually conspicuously rough walled, seldom growing on Sakaguchi & Wang agar

A) Conidia forming definite crusts which easily break away when the culture tube or dish is tapped *P crustosum* series

, *P. crustosum* Thom

B) Conidia forming compact crusts which seldom break away when the culture tube or dish is tapped

1 Conidia globose or subglobose, smooth or nearly so

a Agar surrounding colonies usually quickly and broadly pigmented

1 Colonies remaining bright yellow green in age or tardily becoming light brown shades *P. viridicatum* Westling

2 Colonies blue-green slightly bluish-yellow-green or dull yellow green shades

P viridi cyclopium Abe

b Agar surrounding colonies colorless or tardily weakly pigmented

1 Colonies at first bright or dull yellow green shades but quickly olive or gray green shades.

P olivino-viride Biourge

2 Conidial areas quickly developing dark yellow-green shades

. .. . *P. palitans* Westling

3. Colonies in blue-green shades but quickly grayish olive shades, slightly fasciculate or often velutinous appearing

... . . *P. puberulum* Bainier

2-. Conidia globose to subglobose with echinulate or verruculose walls

1. Colonies in yellow-green shades

. *P palitans* Westling var. *echinoconidium* Abe

2. *Colonies in blue green shades.*

. . *P. cyclopium* Westling var. *echinulatum* Raper, Thom and Fennell

3-. Conidia elliptical to ovate with smooth or nearly so walls

1. Conidia elliptical or ovate, colonies in blue-green shades.

.. . *P cyclopium* Westling

2. Conidia strongly elliptical; non-sporulating or tardily and sparsely growing on malt agar. . *P aurantio-virens* Biourge

2) Conidiophores smooth walled or nearly so, conidia elliptical

.. . *P. urticae & italicum* series

a. Seldom growing on Sakaguchi & Wang agar.

1. Sterigmata seldom more than 6.5 μ in length.

.... . *P. urticae* Bainier

2. Sterigmata usually more than 6.5 μ in length.

. . . *P. expansum* (Link) Thom

b Usually growing on Sakaguchi & Wang agar

1. Conidia seldom cylindrical form, colonies in blue-green shades

. . *P. martensii* Biourge

2 Conidia cylindrical form, colonies in blue or yellow green shades

. . . . *P. italicum* Wehmer

(B Colonies with most of the conidiophores arranged in fascicles or in definite coremia; seldom growing at 37°C

A Conidiophores typically rough walled . . . *P. granulatum* series

1 Conidia globose to subglobose *P. corymbiferum* Westling

2 Conidia elliptical . *P granulatum* Bainier

B Conidiophores smooth walled or nearly so *P claviforme* series

1 Colonies poorly growing on Sakaguchi & Wang agar, coremia typically club-shaped and showing clear differentiation into a compact fibrous stalk and an expanded "sporehead" composed of massed and interwoven penicilli

1 1 Conidial areas in green shades *P claviforme* Bainier

1 2 Conidial areas usually white.

P claviforme Bainier mut *candicans* Abe and Ura

1-3 Conidial areas in olive colors

P claviforme Bainier mut *olivicolor* Abe and Ura

2 Luxuriantly growing on Sakaguchi & Wang agar; coremia typically loose in texture (Isaria-like), often not clearly differentiated into stalk and "sporehead"; commonly appearing feathery, with penicilli usually separate.

P claviger um Demelius

III Penicilli characteristically biverticillate and symmetrical, but sometimes fractional in some species and strains; sterigmata typically lanceolate, with apices long-tapered acuminate.

Biverticillata Symmetrica Section

(1-. Colonies typically producing perithecia or sclerotia

A Colonies producing soft perithecia upon most substrata, usually in bright yellow (luteus) shades. . *P luteum* series

1. Ascospores usually with prominent equatorial ridges

a Strains typically thermophilic, colonies pale salmon colored to dull grayish green

P duponti Griffon and Maublanc emend Emerson

b. Strains not thermophilic, colonies typically bright yellow to greenish yellow.

P. stipitatum Thom

2 Ascospores without definite equatorial ridges

a Ascospore spinulose over their entire surface; asci borne in chains

-1 Ascospores elliptical

a- Perithecia in bright yellow, golden yellow or orange yellow shades

1- Ascospores 4 0 to 5 0 u in long axis.

aa Perithecial initials enlarged, long, clavate, unbranched, colonies spreading broadly *P vermiculatum* Dangeard

bb Perithecial initials irregularly enlarged, septate and often branched, colonies somewhat restricted *P wortmanni* Klocker

2 . Ascospores seldom exceeding 3 0 u in long axis, perithecial initials long helicoid; colonies spreading broadly *P helicum* Raper and Fennell

b-, Perithecia in white to cream or light yellowish shades, perithecial initials conspicuously swollen, often becoming branched

P spiculisporum Lehman

2 Ascospores globose

a- Conidia elliptical with ends somewhat pointed, perithecia in golden yellow to orange-yellow shades *P rotundum* Raper and Fennell

b Conidia bacilliform, rod like, perithecia typically in pale yellow shades

P bacillosporum Swift

b Ascospores not spinulose over their entire surface, asci borne singly as short branches

from fertile hyphae

1 Ascospores with walls pitted; perithecia in bright yellow shades; conidial heads in avellaneous shades . . *P. avellaneum* Thom and Turesson

2. Ascospores with conspicuous *transverse (spiral) bands ("tricostate" of Zukal)*; perithecia in bright yellow shades . . . *P. luteum* Zukal

3 Ascospores with multiple longitudinal ridges; perithecia white or cream colored . .. *P striatm* Raper and Fennell

B Colonies producing sclerotia in greater or less abundance upon most substrata.

1. Sclerotia in dark red or blacksih shades, often elongate; penicilli typically biverticillate and symmetrical

a Sclerotia dark red or reddish black in color, usually more or less rounded and borne upon the substratum . . *P. purpurogenum* var. *rubri-sclerotium* Thom

b Sclerotia black, brownish black, or greenish black, usually elongate, often more or less embedded in the substratum

1-. Sclerotia abundantly produced, often characterizing the culture; conidiophores and metulae conspicuously roughened. . *P novae-zeelandiae* v Beyma

2-. Sclerotia sparsely and tardily produced in occasional strains; conidiophores and metulae smooth-walled or nearly so. . . *P. funiculosum* Thom

3-. Sclerotia reported, conidiophores long and comparatively coarse, usually rough walled . .. *P herquei* series

2 Sclerotia in light cream to yellow shades rounded, penicilli biverticillate, sometimes appearing symmetrical.

.. .. *P. raistrickii* Smith and allied speceis. (in the Divaricata)

(2 . Colonies not producing perithecia or sclerotia

A *Colonies regularly developing abundant, erect coremia, often charcterizing the culture.*

1. Colonies luxuriantly growing at 37°C; penicilli typically biverticillate and symmetrical; sterigmata lanceolate, with tips gradually tapered; colonies developing yellow orange, olive brown or red shades in reverse *P. duclauxi* series

.. . *P duclauxi* Delacroix

2. Colonies seldom growing at 37°C; penicilli typically asymmetrical, sterigmata with tips more abruptly narrowed; colonies seldom developing true red shades in reverse

. . *P. claviforme* series

B Colonies seldom or never developing true coremia

(1) Colonies usually growing at 37°C.

(A. Colonies with surface appearing funiculose, floccose-funiculose, or somewhat tufted; conidiophores arising primarily from aerial hyphae or ropes of hyphae

P funiculosum series

(a Conidial chains tangled or divergent; metulae parallel or somewhat divergent

(1. Conidia strongly elliptical or fusiform, smooth or nearly so; colonies usually developing reddish shades in reverse.

a)- Colonies seldom growing on Sakaguchi & Wang agar.

1 Colonies usually spreading broadly; metulae closely parallel or somewhat divergent. . *P funiculosum* Thom

2. Colonies usually more or less restricted; colonies bristly, showing areas of red, orange or yellow mycelium and dark green conidia, conidia usually fusiform . *P. islandicum* Sopp

b)- Colonies luxuriantly growing on Sakaguchi & Wang agar; colonies usually spreading broadly; metulae more or less divergent, seldom closely parallel *P purpurogenum* var *rubri sclerotium* Thom (non sclerotigenic type)

(2. Conidia never strongly elliptical or fusiform, colonies never developing true red shades in reverse.

1 Conidia globose or ovate, typically verruculose walls . *P verruculosum* peyronel

2 Conidia ovate or sometimes elliptical, with smooth or slightly rough walls; but fractional penicilli usually abundant; conidiophore production suggesting the foot cell of Aspergillus . *P. varians* Smith

(b Conidial chains forming a conical or pyramidal mass, metulae numerous, incurved. *P piceum* Raper and Fennell

-(B Colonies typically velvety or lanose, conidiophores arising primarily from the substratum or from the basal felt *P. purpurogenum* series

-(1. Colonies consistently producing deep red colors in reverse, surface usually heavy sporing and showing an evident but limited development of yellow or orange-red aerial hyphae

a) Strong pigmentation diffusing throughout the surrounding agar, conidia elliptical to subglobose.

1 Metulae closely parallel, colonies growing rather rapidly, sometimes becoming broadly spreading, conidia smooth or slightly roughened *P purpurogenum* Stoll

2 Metulae seldom parallel, usually more or less divergent; colonies more restricted, conidia smooth or nearly so *P rubrum* Stoll

b) Pigmentation seldom diffusing throughout the surrounding agar, but tardily developing very light shades, colonies usually developing rather rapidly and broadly

1) *Conidia with echinulate or verruculose walls*

1 Conidia globose or subglobose. *P aculeatum* Raper and Fennell

2 Conidia usually ovate, occasionally with one end apiculate.

. . *P. aculeatum* Raper and Fennell var *apiculatum* Abe

2) Conidia smooth or nearly so, typical elliptical; metulae usually somewhat divergent; reverse usually in reddish shades in central or subcentral areas localized

1. Sclerotia produced, at least when newly isolated; velutinous or slightly funiculose .. *P purpurogenum* var. *rubri-sclerotium* Thom

2 Sclerotia not produced when newly isolated, velutinous on Czapek agar, but typically funiculose on steep agar

. *P purpurogenum* var *rubri-sclerotium* Thom

(non-sclerotigenic type)

-(2 Colonies developing red-orange, yellow-orange or greenish brown rather than deep red colors in reverse; surface usually characterized by prominent areas of sterile yellow aerial mycelium. .. .. *P. variabile* Sopp

(2) Colonies seldom growing at 37°C, luxuriantly growing on Sakaguchi & Wang agar.

-(A. Conidiophores smooth or nearly so, colonies rather restricted; reverse varying from colorless or yellow to orange-brown shades, and sometimes greenish shades in localized areas, agar surrounding colony usually colorless or with limitedly diffusing heavy or light pigment, colonies velvety or velutinous .. *P. rugulosum* series

1) Colonies usually restricted upon most media; conidia usually more than 3.0 μ in long axis.

a Colony reverse usually orange-brown shades throughout or in localized areas, sometimes greenish shades in localized areas.

1. Conidia elliptical, echinulate or verruculose. *P rugulosum* Thom

2 Conidia strongly elliptical, smooth or delicately roughened

P. concavo-rugulosum Abe

b Colony reverse usually colorless or yellow shades throughout; colonies very thin throughout or with central area somewhat floccose, often wave-like zonate.

. *P. tardum* Thom

2) Colonies growing very restrictedly, conidia usually less than 3.0 μ in long axis

1 Metulae seldom numerous and somewhat divergent.

. *P diversum* Raper and Fennell

2 Metulae numerous and definitely inflated or suggesting divaricate.

P diversum var. *aureum* Raper and Fennell

(B Conidiophores with roughened walls; colonies developing strong green or greenish-brown shades in reverse, velvety or sometimes floccose.

(1 Conidiophores usually less than 6 μ or 7 μ in diameter

a Conidia elliptical

1 Conidia smooth or nearly so, strongly elliptical, near rugby ball form, metulae numerous and suggesting divaricate, conidiophore conspicuous roughened

. *P. herquei* Bainier and Sartory

2 Conidia delicately echinulate, less than 3.4 μ in long axis, colonies usually spreading broadly; metulae not suggesting divaricate.

. *P. paraherquei* Abe

3 Conidia with verruculose or granular walls; colonies growing rather rapidly.

P. estinogenum Komastu and Abe

-b. Conidia globose or subglobose; sclerotia sometimes very abundant

. . . *P. novae-zeelandiae* van Beyma

(2 Conidiophores about 8 μ in diamete. . *P. olsoni* Bainier and Sartory

IV Penicilli large, usually symmetrical, typically branched at three or more levels below the sterigmata Polverticillata Section

P. albicans series

. *P. albicans* Bainier

. . . .. *P. aculcatum* Raper and Fennell var. *apiculatum* Abe

2) Conidia smooth or nearly so, typical elliptical; metulae usually somewhat divergent; reverse usually in reddish shades in central or subcentral areas localized.

1. Sclerotia produced, at least when newly isolated; velutinous or slightly funiculose. . .. *P. purpurogenum* var *rubri-sclerotium* Thom

2. Sclerotia not produced when newly isolated, velutinous on Czapek agar, but typically funiculose on steep agar

. . *P purpurogenum* var. *rubri-sclerotium* Thom (non-sclerotigenic type)

-(2 Colonies developing red orange, yellow-orange or greenish brown rather than deep red colors in reverse; surface usually characterized by prominent areas of sterile yellow aerial mycelium . *P variabile* Sopp

(2) Colonies seldom growing at 37°C, luxuriantly growing on Sakaguchi & Wang agar.

-(A. Conidiophores smooth or nearly so; colonies rather restricted, reverse varying from colorless or yellow to orange-brown shades, and sometimes greenish shades in localized areas, agar surrounding colony usually colorless or with limitedly diffusing heavy or light pigment; colonies velvety or velutinous . .*P. rugulosum* series

1) Colonies usually restricted upon most media, conidia usually more than 30 μ in long axis

a Colony reverse usually orange-brown shades throughout or in localized areas, sometimes greenish shades in localized areas

1 Conidia elliptical, echinulate or verruculose . . . *P. rugulosum* Thom

2 Conidia strongly elliptical, smooth or delicately roughened.

. . *P. concavo-rugulosum* Abe

b Colony reverse usually colorless or yellow shades throughout; colonies very thin throughout or with central area somewhat fleccose, often wave like zonate

. *P tardum* Thom

2) Colonies growing very restrictedly; conidia usually less than 30 μ in long axis

1. Metulae seldom numerous and somewhat divergent.

... . *P. diversum* Raper and Fennell

2 Metulae numerous and definitely inflated or suggesting divaricate.

P diversum var. *aureum* Raper and Fennell

-(B Conidiophores with roughened walls; colonies developing strong green or greenish-brown shades in reverse, velvety or sometimes floccose.

(1 Conidiophores usually less than 6 μ or 7 μ in diameter.

a Conidia elliptical

1 Conidia smooth or nearly so, strongly elliptical, near rugby-ball form; metulae numerous and suggesting divaricate, conidiophore conspicuous roughened.

P herquei Bainier and Sartory

2 Conidia delicately echinulate, less than 3 4 μ in long axis; colonies usually spreading broadly, metulae not suggesting divaricate.

P. paraherquei Abe

3 Conidia with verruculose or granular walls, colonies growing rather rapidly

P estinogenum Komastu and Abe

-b Conidia globose or subglobose, sclerotia sometimes very abundant

P novae-zeelandiae van Beyma

(2 Conidiophores about 8 μ in diamete *P olsoni* Bainier and Sartory

IV Penicilli large, usually symmetrical, typically branched at three or more levels below the sterigmata Polverticillata Section

P albicans series

P albicans Bainier

I. 培養基

A　初期の研究に用いられた培地。

1. Raulin's solution.
2. Bean Agar and Potato agar
3. Potato-Dextrose agar.
4. Licorice Sticks
5. Prune Gelatine.
6. Wort or Beer Wort.

B. 現在の研究に用いられている培養基。

1)　ツァペック寒天培地

蒸溜水	1000 c.c.
$NaNO_3$	3.0 grams
K_2HPO_4	1.0 gram
$MgSO_4 \cdot 7H_2O$	0.5 gram
KCl	0.5 gram
$FeSO_4 \cdot 7H_2O$	0.01 gram
蔗糖	30.0 grams
寒天	15～20 grams

(pH 無修正，7.0 に近い)

2)　似ツァペック寒天培地（分離用）

蒸溜水	1 000 c.c.
$NaNO_3$	2.0 grams
$MgSO_4 \cdot 7H_2O$	0.5 gram
KCl	0.5 gram
$FeSO_4 \cdot 7H_2O$	0.01 grams
葡萄糖	10.0 grams
寒天	30.0 grams

（使用時に 0.2N-HCl にて 4.3～4.4 にする）

3)　ステープ寒天培地　ツァペック寒天培地に 10 gms のコーンステイープ液を加えた培地。pH は殺菌前に N-NaOH で 7.0 に修正す。

4)　麦芽汁寒天

麦芽抽出汁（Difco 製）	20 grams
デキストローズ	20 grams
ペプトン	1.0 gram
寒天	25.0 grams
蒸溜水	1 000 c.c.

寒天は他各物を加える前に加圧釜で水に溶かし　pH は約 4.7 無修正、2.5% 寒天を用い，殺菌時に培

地を調合す。

他法は，1kg 麦芽に水5Lを加え 65°C で糖化後，濾過し，10° Ballg 糖液とし，pH 4.7 に修正，20〜25 gr/L の寒天を加えて殺菌す。

5) 麹汁寒天．米麹 1kg に水 5L を加え 60°C で糖化後，濾過，10° Ballg 液とし，pH 6.0 に修正，1L 宛寒天を 20 gr 加えて殺菌す。

6) コーンミール寒天培地．

50 gr 挽割玉蜀黍粉に 1L の水で1時間煮沸後，濾過，原液量にし，20 g/L の寒天を加え殺菌す。

7) 乾草煮沸寒天培地：

50 g 乾草を水 1L で 30 分間加圧後，濾過，K_2HPO_4 2g と寒天 20g を加える，pH は HCl にて 6.2 とし殺菌する。

8) 20% 蔗糖ツアペック培地

3% 蔗糖を 20% とする以外ツアペック寒天培地と同様，pH 無修正。

9) 坂口氏寒天培地（亜硝酸培地）：

ツアペック寒天培地組成中の 30g 硝酸ソーダの代りに亜硝酸ソーダを 15g 加えたる培地，pH は NaOH にて 7.0 とする，

II. 培 養 法

1) 試験管培養

本法はペニシリウム菌株を取扱うには必ず用いる培養法であり，試験管の移植は菌糸又は分生胞子の採択した小塊を白金線にて移し植える事である。送られて来た菌株標本或は新しく自然界から分離した菌株を研究する場合，如何なる研究を行う前にも先ず試験管の移植をする必要がある。併しながら本培養法は正式の観察には次の諸理由にて不都合である。

① 集落の面積が一般的に非常に小さく且つ総ての培養特性を示さない。

② 直接低倍率の検鏡が不可能である。

③ 適当なる顕微鏡用標本を作成する場合に生育した集落の適当なる部分を注意深く採択が出来ず，且容易に取り上げ難い。

然し，試験管培養は大体の培養諸特性を知るのには便利である

2) 平板培養

a) 点培養　最も普通に用いられている方法で，元培養の撰んだ所より分生胞子の塊又は菌糸の小片を寒天平板上に点移植を行い集落を形成せしめる

又平板上の希望する所に限られた数の集落を発現せしめたいときには，殺菌水或は溶かした約 45C の寒天に分生胞子を懸濁し，この胞子懸濁液を少量新しい平板培地に移して培養を行う

観察用には一，二，又は以上の集落が望ましく，この場合は上記方法にて行う

b) 試験管平板培養　試験管平板にて単一集落を形成せしめる培養法で，発芽の度合　栄養源の濃度に影響する寒天層の厚さの変化の影響，又は集落発育の比較或は様相へ著しく影響する因子等を研究する事が出来る　本法は多くの菌株の一般的特徴による撰別に便利である

c) 稀釈培養法　本法は或る種の実験，特に土壌又は他の自然物よりの菌株の分離には非常に有用である又汚染の結果二つ又はそれ以上の青かびが混生した時の分別に役立つ

本法は試料の小量を溶した寒天又は殺菌水に入れ，寒天が塊まらぬ様に注意深く混ぜ，ピペット又は白金線でこの懸濁液の少量を第2番目の寒天又は殺菌水試験管に移し，又之を3番目に移し，・・，試料の望ましい稀釈液を作成する。

この稀釈寒天はペトリーシャレーに注入し，固化せしめ，又一方水稀釈液は寒天平板上に少量注入し培養を行う。

d) 線条培養： 天然試料よりのペニシリウムの分離或は二つ以上の菌株を分別するには本培養は上記 (c) よりも一層容易である。本培養にては試料の最少量を移植し且つ各集落が分別して発育するように充分の距離を取って線条を行う必要がある。又本培養はペニシリウムの不安定な菌株に於ける自然変異の研究に屢々用いらる。

e) 単胞子培養　稀釈培養に於て単一細胞より発育する真の％は元液中に存在する分生胞子を，血球計測器ての計測値と出現集落数を比較し決定出来る。然し単一胞子より生育した集落であるか，又は二つ或は以上の細胞より生育した集落てあるかを探知する事は不可能てある。研究者は単一胞子より生育した集落である事を確め知る必要がある場合は，micro-manipulator 又は cutting disk 法を用う。

別法としては清浄剤のラウリルスルフォン酸ソーダの 15 倍稀釈殺菌水に分生胞子を良く分散せしめ，この適当稀釈液を栄養寒天上に注意深く拡散せしめ適温 (25°C) にて一夜培養すると発芽す。このシャレーを翌日双眼顕微鏡にて検鏡し，分離した発芽細胞の位置に印を附し，次いて顕微鏡下で分離用の細胞附近に未発芽胞子が存在せぬ事を確めて印を附す。白金線て作ったスパチュラにて摂んだ分生胞子の周辺ノ天も一緒に小塊を低倍率検鏡下で新しい寒天平板上に移植し，更に摂んだ発芽胞子が移植されたかを再確認す

III. 分離，撰択，点培養

自然界の各種試料からのペニシリウム菌株の分離には稀釈培養又は線条培養法を行い（必要に応じて繰返す）。25°C 又は 30°C にて 4～5 日間培養して出現した単一集落より分生胞子をツアペック寒天試験管に移植し，25°C に，5～7 日間培養す。之等の新しく分離した数多くの菌株から集落の各特性に基ずいて同一様菌株を撰び出し次に全菌株について単胞子分離法を行って後，集落特性の厳密な観察に依り，特長的な菌株を撰択す。

以上の単胞子分離又は稀釈法にて自然界から分離した時と同一様と認められる各菌株を次の同定に用いる

同定方法は常に 5～7 日間 25°C に培養したツアペック寒天上に生育した normal strain（正常菌株）の一点より分生胞子の小塊をペトリーシャレー寒天上に点移植 (Spot inoculation) を行い，培養日数に従い後記諸特性を厳密に検討し所属菌種 (Species) を決定する。

著者等は一つのペトリーシャレーに一つの集落を形成せしめ，各試験には常に同一条件に3枚以上を用い，上記各種培地を用いて 5°, 15°, 25°, 30, 37°C の各温度に培養を行った。Raper, Thom, Fennell 氏等は常に一つのペトリシャレー上に3集落を形成せしめる方法を採用した。

IV. 観察と記載

(1) 集落の諸特性

1 生育の程度　各培養温度に於ける 5 日目，10～12 日目，20～22 日目（又は必要に応じて以上）の集落の直径を計測する

2 集落の厚み　培養 5～6 日目又は 10 日目の集落の円周部から中心に向って集落の断片を切り取りスラ

イトレに載せ、集落円周部、中間部、中心部の高さ（厚み）を計測す。

3. 集落の菌叢　肉眼，拡大鏡，又は顕微鏡の低倍率にて、Raper, Thom, Fennell 氏等（1949）の記述せる所謂ビロード状，類似ビロード状，幾分か綿毛状，綿毛状又は羊毛状，又は羊毛状，又は束状或は結束糸状の何れかを観察決定する。

4　集落表面　本特性は拡大鏡又は肉眼にて，滑面，平面或は凹面，皺，隆起線があるか，菌糸の着色，輪生状の発育を呈するか等の諸特性を観察記載す。

5　集落円周部の特性　集落円周部の諸特性即ち滑面，鋸歯，粉状　又は顆粒状，束状，薄い，狭い，広い，菌糸の呈色，円周部の幅等は肉眼，拡大鏡，顕微鏡の低倍率にて観察す。

6　集落呈色及び色調の変化　分生胞子着生部の着色又は色調は培養 10～12 日目及び 20～22 日目の色合を Ridgway Color table に照合し、記載す。或る場合には集落円周部，中間部，中心部と着色調が異っているので別々に記載す，之等の色調の変化は生育期間を通じて観察す。

7　集落裏面・　集落裏面の呈色，色調は 6 同様である

8　滲出物・　水滴の発現は著しい特色であり，その有無，量，着色，色調を観察す

9　培地の着色　寒天の着色は著しい特色で，培養 10～12 日目又は 20～22 日目の着色の幅，その呈色，色調を記録，4～5 週間生育期の特長的呈色，又は色調の変化を記録する。

2）顕微鏡観察に依る諸特性。

微細構成体の観察並びに計測は次の 4 法に依り記載す

1　直接観察法・　分生胞子連鎖，分生胞子柄の長さ，分生胞子連鎖の形，閉子器，菌核，梗子，基附梗子，分枝等の分岐着生状態及数　等は顕微鏡下で集落又は斜面培養を壊さずに直接観察す。

2　乾燥標本法　分生胞子，梗子，基底梗子，分枝，分生胞子柄，閉子器，菌核等の計測　形，側面の様相のデーターはガラススライド上に乾燥標本を作って検鏡し記載する

3　液体標本法　分生胞子構成体の小塊をガラス　スライド上で 70％ のアルコールで手早く洗い，グリセリン，1　アルコール，2　水，3 の溶液に移し変え，パラフィンで封して半永久標本を作る　梗子，基底梗子，分枝，分生胞子柄　子嚢　子嚢胞子等の各サイズは液体標本の検鏡にて記載す

4　電子顕微鏡写真法　必要に応じて　分生胞子及其の他の微細構造は 25°C，22～30 日培養のシアペック寒天培養より 'Formvar" film (Vinyl acetate formaldehyde polymer) 或は Collodion SiO film の 200 メッシュ銅製スクリーン上に採り乾燥

本標本を電子顕微鏡にて検鏡，2500～3000 倍の写真を撮り，後引伸ばして検討，顕微鏡実測結果と照合その正確度を補足す

V. ペニシリウム属の分類

I ペニシラスは単一房状，菌糸又は分生胞子柄の先端に梗子の群生を有し，分生胞子柄は通常分岐せず，或る場合は不規則に分岐しているが各々分岐が明確に分れて単輪生状ペニシラスを有す。

. . Monoverticillata Section (単輪生区)

1. 集落に被子器，菌核を形成す。

A. 豊富に被子器を形成，時に成熟が遅れる。

1. 被子器は最初頑丈又は菌核様で，中心部より順次成熟す。

a. ペニシラスは単輪生状又は断片的

. *P. javanicum* series

1 多くの培養にて赤色或は赤褐色調色素を形成，

aa 子嚢胞子はレンズ状，2.5×3.0μ，赤道様隆起線は欠，屡々線の如き皺があり，明確な粗面

. . *P. javanicum* van Beyma

bb 子嚢胞子はレンズ状，長さ約 2.0μ，明確な赤道線様隆起又は皺を有し，粗面，

. ..... *P. parvum* Raper and Fennell

2. 培地に赤色又は赤褐色調色素を不形成，

aa 子嚢胞子はレンズ状，長軸は 3.0〜3.5μ，皺は明確にあるが著しくはない，大刺状粗面，ペニシラスは単輪生状

. . .. *P. prefeldianum* Dodge

bb 子嚢胞子はレンズ状，長軸は 3.5〜4.0μ，著しい大刺状粗面，著しい皺を有し，ペニシラスは少く且つ断片的，

.. *P. ehrlichii* Klebahn

cc 子嚢胞子はレンズ状，径約 4.0μ，皺はなく，赤道様線を示し滑面；ペニシラスは非常に少なく，屡々単一梗子様

P. levitum Raper and Fennell

b ペニシラスは双輪生状，単輪状も有り，被子器は最初菌核様で且成熟が遅い。

Carpentles series (in the Divaricata)

2 被子器は軟く，不明確な菌糸に覆れ，ペニシラスは一般的に断片的で，屡々単輪生状

a. 子嚢は大きく，長軸 7.0〜8.5μ 幅広い楕円形，5〜8 ケの明確な縦線様，凸線又は隆起があり，明確な赤道様皺ではない。

P. striatum Raper and Fennell (in *P. luteum* series)

b 子嚢は小，長軸 2.8〜3.2μ，単一赤道線様隆起線或は二つの近接した隆起線を有す

P. stiptitatum Thom (in *P. luteum* series)

B 集落は菌核を形成，屡々若い被子器を暗示せしめるが，しかし子嚢形成時様には生存せず，

(1) ペニシラスは純単輪生状，

a 菌核は凡ての培地上にて形成 硬く，壊れ難く 又漬すに困難 厚い硬細胞組織様細胞から出来て

P. thomii series

1) ノアヘック寒天培養の集落裏面は，くすんだ又暗紫色を呈せず

1 菌核は無色て，輝橙赤色菌糸にて包まれている。

P. sclerotiorum van Beyma

2 菌核は薄糸又は桃色調，併し橙赤色菌糸に包まれていない。

a. 集落は灰緑色調，集落直径は小

P. thomii Maire

b 集落は輝黄緑色調，集落直径やや大

P. thomii Maire var. *flavescens* Abe

3 菌核は橙褐色調，黄，橙又は明褐色菌糸の不明瞭な菌糸帯に包まれていて，皮状にはならぬ。

P lapidosum Raper & Fennell

2) ノアヘック寒天上の集落裏面はくすんだ又は暗紫色調，菌核は明桃褐色調，集落は直径小；菌糸は灰薄紫桃色又は褐色調。

P. cinnamopurpureum Abe

b 菌核は数種の培地ては形成するがノアヘック寒天培地等ては作らぬ，比較的柔らかく，厚い壁の似柔軟細胞組織て構成されている。

P turbatum sub-series

1 ノアヘック寒天上の集落裏面はくすんだ，又は暗紫色調にならぬ，直径幾分か小。

P turbatum Westling

2. ノアヘック寒天上の集落裏面はくすんだ又は暗紫色調，集落直径は非常に小。

P pusillum Smith

(2) ペニシラスは不整斉双輪生状

P raistrickii series (in the Divaricata)

2 集落は被子器或は菌核を作らぬ。

(A 分生胞子柄は一般的に分岐せず，単一な真単輪生状ペニシラスを着生す。

(1 分生胞子は球形又は亜球形

Monoglobosa series

A) 分生胞子は著しい粗面

1) 集落は一般的に多くの培地上て直径大，5°C にて発育す。

1 分生胞子は著しく大きな疣状又は刺状粗面，集落裏面は赤又は褐色調，菌叢ビロード状

P purpurrescens (Sopp) Raper, Thom Fennell

2 分生胞子小刺状粗面，集落裏面無色又は薄黄，薄桃色又時々紫或は赤色調，菌叢ビロード状，又は不明瞭な菌叢を呈す。 *P spinulosum* Thom

2) 集落は多くの培地て直径むしろ小，5°C にて発育せず

a 坂口・工培地に発育せず

1 分生胞子は著しく 大刺状粗面 集落裏面は薄桃赤色又は黄色調 菌叢は繊状。

P lilacino-echinulatum Abe

b　坂口・王氏大培地に発育

2　分胞子は大刺又は顆粒粗面，分生胞子着生部はくすんだ灰色又は煙灰色調，集落裏面はくすんだ黄色調，菌叢綿毛状。

. . *P. restrictum* Gilman & Abbott

3.　分生胞子は著しい大刺状又は塔状粗面，分生胞子着生部はオリーブ緑色から暗灰褐色調に変る，集落裏面は無色，菌叢は綿毛状

. *P. fuscum* (Sopp) Raper, Thom & Fennell

B）分生胞子は滑面又は 0.1 μ 以下の僅少な粗面。

1）集落の直径大。

1.　分生胞子柄は常に 100 μ 以上の長さ，坂口・王培地に生育す。

. *P. frequentans* Westling

2.　分生胞子柄は非常に短く，菌叢は縄状

. .. *P. adametzi* Zaleski.

2）集落の直径やゝ小。

a.　坂口・王培地に生育。

1　集落裏面及寒天は速やかに檸黄色調に着色．

i　分生胞子は軽い青緑又は黄緑色調，裏面は全面檸黄色調

. *P. citreo-viride* Biourge.

ii.　分生胞子は薄黄緑色調 (Sage Green, Vetiver Green に近い)，集落裏面の中心部は橙褐色或はオリーブ緑褐色調，

P. citreo-viride Biourge var. *aeneum* Abe.

2　集落裏面及び寒天は濃い葡萄紫桃色又は紫色調

. .*P. vinaceum* Gilman & Abbott

b　坂口・王培地に発育不能

1　菌糸は通常着色す，

i　栄養菌糸は黄，橙，橙赤色，分生胞子柄は 60 μ 以上の長さ，菌叢はビロード又は類似，

P. multicolor G-M and P

ii　栄養菌糸は白色又は薄紫桃色，分生胞子柄は 60 μ 以下の長さ，菌叢やや綿毛状

P. roseo-purpureum Dierckx

2　栄養菌糸は着色せず　集落は縄状に富んでいる

P. terlikowskii Zaleski.

(2　分生胞子は楕円又は卵形或は亜球形

Monoelliptica series

A　分生胞子著しい粗面，電子顕微鏡写真にては大刺状は疣状又は（小結状）粗面，

1）集落は寧ろ発育早く　直径大，5 C にて発育す

1　分生胞子着色部は青緑又は黄緑色調，集落裏面暗赤色，赤黒色或は濃紫褐色調

P. trzebinskii Zaleski

2　分生胞子着生部は黄緑色調，裏面無色；分生胞子の長軸 4.5 μ 以上。

P. trzebinskii Zaleski var. *magnum* Sakaguchi and Abe

3　分生胞子着生部は黒緑或は暗青緑色調；裏面は部分的に紫褐色或は緑色調；常に強いバニラ様芳香を作る。

P. trzebinskianum Abe.

2)　集落は殆んどの培地上にて直径小；5°C に発育せず；分生胞子着生部は暗黄緑色調，裏面無色。

P. fusco-flavum Abe

B.　分生胞子滑面或は 0.1 μ 以下の僅小粗面。

（1）　集落直径大。

a　坂口・王培地に発育す；分生胞子柄は長さ 350 μ 以上。

1.　分生胞子は楕円形；集落黄緑色順次オリーブ又は暗オリーブ褐色，裏面黄色，或は薄桃色調。

P. lividum Westling.

2　分生胞子楕円又は卵形，集落は黄緑遅れて 4 週間以上にて薄褐色調，裏面紫或は赤色順次黄色調

P. aurantio-violaceum Biourge

b　坂口・王培地に発育不能，分生胞子柄は長さ 100 μ 以下，集落裏面薄桃褐色又は赤色調。

P. chermisinum Biourge.

（2）　集落の直径小。

a.　集落の裏面及寒天は著しく着色す。

1)　坂口・王培地によく生育，集落裏面及び周辺の寒天は赤紫又は紫色調。

P. phoeniceum van Beyma

2)　坂口・王培地に発育不能。

1　5°C 或は 37°C にて発育不能，分生胞子着生部は濃青緑又は青灰緑或は暗黄―緑色調，集落裏面は黄，橙，赤色又時に紫或は茶色調，周辺寒天は鮮或は薄黄色調。

P. implicatum Biourge

2　37°C に発育，5°C にて発育不能，分生胞子着生部は青灰緑色調，集落裏面又は周辺寒天は橙赤或は赤褐色調

P. sublateritum Biourge

3　5°C に発育，37°C に発育不能，分生胞子着生部は薄黄緑色調；集落裏面又は周辺寒天橙，又は橙褐色又は薄褐桃色調。

P. adametzioides Abe

b　集落の裏面及び寒天は無色又は僅小な着色

1)　集落はビロード状又は類似菌叢，分生胞子着生部は黒緑又は暗青緑色調

1　坂口・王培地に生育，37°C に発育不能，分生胞子着生部は黒黄緑色調，裏面は無色或は部分的に中心部僅少な緑色調

P. decumbens Thom var. *atro-virens* Abe

2　坂口・王培地に発育不能；37°C にて生育；分生胞子着色部は暗青緑色調　集落裏面は中部褐赤色調。

. . . . .*P. fellutanum* Biourge var. *nigro-castaneum* Abe

2）集落菌叢ビロード状，しかし常に表面僅小綿毛状，集落は黒緑或は暗青緑色。

1.　集落菌叢は不明確で，短い分生胞子柄を持った交錯菌糸帯を有し，裏面は無色，順次僅小桃又は緑色調。

... .. *P. decumbens* Thom.

2.　集落は緻密な菌叢で，強靭，且硬く，集落円周部は硬く，且つ細菌菌糸を有す，裏面薄褐色或は薄黄色調。

. . . .*P. fellutanum* Biourge.

(B.　分生胞子柄は殆んど分枝，屢々再分枝し各々単輪生状ペニシラスを有す，しかし基底梗子，(或は分枝の如き着生ではない。

. .. . Ramigena series

1）分生胞子は明確な楕円形，滑面。

1　分生胞子は楕円又は両端が尖らず，広い円筒形（カプセル形）。

... .. . *P. capsulatum* Raper and Fennell.

2　分生胞子は両端が幾分か尖っている。

. .. *P. cyaneum* (B and S) Biourge.

2）分生胞子球形，卵形，或は幾分か楕円。

A　集落は直径小。

1.　分生胞子は球形又は亜球形，少し粗面，分生胞子連鎖は散開状で，円柱状にはならぬ。

. ...*P. waksmani* Zaleski

2.　分生胞子は卵形又は僅小楕円形分生胞子連鎖は平行状，又は緻密な円柱状。

. . ..*P. charlesii* Smith.

B.　集落は直径大。

1.　分生胞子は球状乃至は亜球形，幾分か粗面。

. *P. charlesii* Smith var *rapidum* Abe

2.　分生胞子は球形乃至は卵形，著しい大刺又は瘤状粗面。

. . *P. velutinum* van Beyma.

II　ペニシラスは基底梗子の下位にて特長的に一回乃至は二回分岐；不整斉状で不規則或は一方的；梗子は槍針状ではない

. Asymmetrica Section

(A　ペニシラスは特長的に著しい散開状で，個々の構成体も同様で，屢々単輪生状を示すが，単一分岐したペニシラスの様相を呈する如く着生してゐる。

.. .. . Divaricata Sub-section.

(1　集落は被子器　菌核を作る。

a　集落は被子器を作る　最初は柔軟細胞組織であり屢々遅れるが常に堅細胞組織になる。

. Carpentless series

1　子嚢胞子はれんず状，長軸は 25～30 μ，赤道様襞が著しく且つ粗面。
被子器は灰色又は灰黒色（湿った時），5～6 週間目に成熟す。

P. asperum (Shear) Raper Thom & Fennell.

2　子嚢胞子はれんず状，長軸 50～60 μ，赤道様隆起線は並行し又屡々重複し粗面。被子器は 3～4 週間にて成熟し，淡黄褐，又は明るい褐色調。

P. baarnense v. Beyma.

3　子嚢胞子はれんず状，長軸 28～33 μ，赤道様域は広く，平坦で常に二つの低い，幅広くはなれた隆起を示し，滑面，被子器は 2～3 週間目に成熟し，クリーム色乃至明るい褐色調。

P. egyptiacum v. Beyma

b　集落は菌核又は厚い壁の細胞の塊りを形成，しかし子嚢又は子嚢胞子を形成せず。

1　集落はビロード様菌叢，分生胞子柄は基質又は気菌糸より生育す。

P. raistrickii series

a.　分生胞子柄粗面，菌核はよく構成され，硬く強固た。

1.　菌核は硬く，白又は桃色調，栄養菌糸は白色。

P. raistrickii Smith

2　菌核は非常に堅牢たが，菌膜細胞組織てはなく，黄色乃至は褐色調，栄養菌糸は黄色調で，黄色顆粒状に被さる。

P. pulvillorum Turfitt.

b　分生胞柄は明確な粗面，真の菌核てはないが殆んどの培地上にて厚壁の細胞の小円塊を形成，特に麦芽汁寒天にては著しい。

P. soppi Zaleski

c.　分生胞子柄は滑面。

1　白色又は桃色菌核を形成。

P. rolfsii Thom

2　厚壁細胞の小塊（*P. soppi* の如き）を成る菌核て形成。

P. micznskii Zaleski (*P. janthinellum* series)

2　菌叢は結束糸状で，分生胞子柄は多少束状又は房状に集生している。

The Fasciculata

a　菌核は豊富に形成，屡々 20 C 以上の培養温度の集落にて特長的。

P. gladioli Machacek

b　菌核は形成すと報告されたが，余り豊富には形成せぬ。

P. italicum Wehmer

(2　集落は被子器，菌核，厚壁の細胞塊を形成せず。

(a　集落の分生胞子は緑　灰緑或は青緑色調を呈せず。

1　集落は桃色，淡桃色又は紫色調

P. lilacinum series

1-a　集落裏面は淡桃又は紫赤色調

P. lilacinum Thom

2. 坂口・工培地に発育不能；37°C にて生育；分生胞子着色部は暗青緑色調，集落裏面は中心部褐赤色調。

. . . .. *P. fellutanum* Biourge var. *nigro-castaneum* Abe

2) 集落菌叢ビロード状，しかし常に表面僅小綿毛状，集落は黒緑或は暗青緑色。

1. 集落菌叢は不明確で，短い分生胞子柄を持った交錯菌糸帯を有し，裏面は無色，順次僅小な桃又は緑色調。

.. .. *P. decumbens* Thom

2 集落は緻密な菌叢で，強靭，且硬く，集落円周部は硬く，且つ細緻菌糸を有す，裏面薄褐桃色或は薄黄色調。

.. . .. *P. fellutanum* Biourge.

(B 分生胞子柄は殆んど分岐，屡々再分岐し各々単輪生状ペニシラスを有す，しかし基底梗子，（或は分枝）の如き叢生ではない。

.. Ramigena series.

1) 分生胞子は明確な楕円形，滑面。

1 分生胞子は楕円又は両端が尖らず，広い円筒形（カプセル形）。

....*P. capsulatum* Raper and Fennell

2. 分生胞子は両端が幾分か尖っている。

.. . .. *P. cyaneum* (B and S.) Biourge

2) 分生胞子球形，卵形，或は幾分か楕円。

A. 集落は直径小。

1 分生胞子は球形又は亜球形，少し粗面，分生胞子連鎖は散開状で，円柱状にはならぬ。

.. .. *P. waksmani* Zaleski

2. 分生胞子は卵形又は僅小楕円形分生胞子連鎖は平行状，又は緻密な円柱状。

. .. .. *P. charlesii* Smith.

B 集落は直径大。

1. 分生胞子は球状乃至は亜球形，幾分か粗面。

. . *P. charlesii* Smith var. *rapidum* Abe.

2. 分生胞子は球形乃至は卵形，著しい大刺又は孔状粗面。

.. .. *P. velutinum* van Beyma

II ペニシラスは基底梗子の下位にて特長的に一回乃至は二回分岐；不整斉状で不規則或は一方的；梗子は槍針状ではない

Asymmetrica Section.

(A ペニシラスは特長的に著しい散開状で，個々の構成体も同様で，屡々単輪生状を示すが，単一分岐したペニシラスの様相を呈する如く着生してゐる。

Divaricata Sub-section.

(1 集落は被子器，菌核を作る

a 集落は被子器を作る 最初は柔軟細胞組織であり屡々遅れるが常に硬細胞組織になる。

Carpentless series

1 子囊胞子はれんず状，長軸は 25～30 μ，赤道様皺が著しく且つ粗面
被子器は灰色又は灰黒色（湿った時），5～6 週間目に成熟す。

. . . *P. asperum* (Shear) Raper. Thom & Fennell.

2. 子囊胞子はれんず状，長軸 50～60 μ，赤道様隆起線は並行し又屡々重複し粗面，被子器は 3～4 週間にて成熟し，淡黄褐，又は明るい褐色調。

. . *P. baarnense* v Beyma

3 子囊胞子はれんず状，長軸 28～33 μ，赤道様域は広く，平坦で常に二つの低い，幅広くはなれた隆起を示し，滑面，被子器は 2～3 週間目に成熟し，クリーム色乃至明るい褐色調。

. . *P egyptiacum* v. Beyma.

b 集落は菌核又は厚い壁の細胞の塊りを形成，しかし子囊又は子囊胞子を形成せず。

1 集落はビロード様菌叢，分生胞子柄は基質又は気菌糸より生育す。

. *P raistrickii* series.

a、分生胞子柄粗面，菌核はよく構成され，硬く強固た。

1. 菌核は硬く，白又は桃色調，栄養菌糸は白色。

. *P. raistrickii* Smith

2 菌核は非常に堅牢たが，柔膜細胞組織てはなく，黄色乃至は褐色調，栄養菌糸は黄色調で，黄色顆粒状に被さる。

. . *P pulvillorum* Turfitt

b 分生胞柄は明確な粗面，真の菌核てはないが殆んとの培地上にて厚壁の細胞の小円塊を形成，特に麦芽汁寒天にては著しい。

. .. *P. soppi* Zaleski

c. 分生胞子柄は滑面。

1 白色又は桃色菌核を形成。

P. rolfsii Thom

2. 厚壁細胞の小塊（*P soppi* の如き）を成る菌核て形成，

P miczynskii Zaleski (*P janthinellum* series)

2 菌叢は粘束糸状で，分生胞子柄は多少束状又は房状に集生している。

The Fasciculata

a 菌核は豊富に形成，屡々 20 C 以上の培養温度の集落にて特長的。

P gladioli Machacek

b 菌核は形成すと報告されたか，余り豊富には形成せぬ

P italicum Wehmer

(2 集落は被子器，菌核，厚壁の細胞塊を形成せず。

(a 集落の分生胞子は緑 灰緑或は青緑色調を呈せず。

1 集落は藤色，淡桃色又は赤色調

P. lilacinum series

1-a 集落裏面は淡桃又は紫赤色調

P lilacinum Thom

1-b. 集落裏面は非黄色調。

. ... *Spicaria violacea* Abbott.

2 集落は桃色又は薄桃紫色調。

. . . *P. humuli* van Beyma

3. 集落はビロード状，分生胞子着生部は褐色，クリーム又は白色調で，緑色は呈せず。

. . . ...Natural mutants of many species

(b 集落は分生胞子が成熟したとき緑，灰色，灰緑，或は青緑色調。

《-1. ペニシラスは顕著な散開型特性で，分生胞子柄上にて梗子を持った分枝又は基底梗子が散開状に着生，或は単に輪生状様に集合したる如し。

-(A. 成熟した分生胞子は薄青緑，灰緑色調又集落裏面は屡々濃着色す。

-(1 分生胞子連鎖は著しい散開型で順次鎖状になるが，円柱状にはならぬ。

-a) 梗子は細く急に尖っている。

. .. *P. janthinellum* series

1) 分生胞子は楕円，大刺状突起が螺旋形に又交叉帯状に着した粗面。

.. *P. daleae* Zaleski

2) 分生胞子は滑面又は粗面；突起が螺旋形に又交叉帯状には着生せず。

a. 新しく分離したときは集落裏面，栄養菌糸は著じるしい濃呈色（橙，赤色，赤紫色，等）

P. janthinellum Biourge

b 集落裏面は無色或は黄，橙色調，栄養菌糸は無色，或は微黄，薄桃色調。

（1） 分生胞子柄は粗面。

1. 集落裏面は無色又は黄色調；ペニシラスは散開状基底梗子の末端群生を有す

.. *P. simplicissimum* (Oud) Thom

2 集落裏面は橙色調；ペニシラスは不規則。

P. ochro-chloron Biourge

（2） 分生胞子柄は滑面。

1. 分生胞子は著しい粗面

P. piscarium Westling

2. 分生胞子は滑面

P. miczynskii Zaleski

-b) 梗子は急激に尖っていない

P. godlewskii Zaleskii

(2 分生胞子連鎖は円柱状を呈し；分生胞子は球形，亜球形，又は卵形。

P. canescens series

1 集落裏面は橙赤或は濃赤色調，分生胞子は球形，滑面。

P. nalgiovensis Laxa

2 集落裏面及び周辺寒天は濃赤色調；分生胞子は卵形，大刺又は瘤状粗面。

P. echinulo-nalgiovense Abe

3. 集落の裏面は橙色順次赤褐色調；分生胞子は球形，滑面又は僅少粗面。

. *P. canescens* Sopp

4. 集落裏面は無色或は淡桃又は黄色調，暗濃呈色にはならぬ，分生胞子は球形，幾分か刺状粗面。

. *P. jenseni* Zaleski.

-(B 成熟分生胞子は鉄灰色又は暗オリーブ灰色の如き，くすんだ灰色調，球形，集落裏面は黄又は濃橙色調。

P. nigricans series

1) 分生胞子柄は滑面，

A 分生胞子は著しい尖った大刺状又は大刺状粗面，

1 集落はくすんだ，又は暗灰色調；集落径小，

P nigricans (Bainier) Thom

2 集落はくすんだ又は暗灰色調；集落直径大。

. . *P. nigricans* (Bainier) Thom var. *sulfuratum* Abe

3 集落は白色調，僅少分生胞子の着生；綿毛状菌叢。

P. albidum Sopp

B 分生胞子幾分か大刺状粗面。

P kapuscinskii Zaleski

2) 分生胞子柄，粗雑な粗面，麦芽汁寒天で特に著しい

1 分生胞子尖った大刺状粗面。 *P melinii* Thom.

2 分生胞子滑面。

. *P. raciborskii* Zaleski

(-2 ペニシラスは散開状なれども，基底梗子が単一な位置に常に着生した緊密様の双輪生状を呈し且分生胞子連鎖は明らかに散開した緊密な円柱状。

P citrinum series

(B ペニシラスは著しい散開状を呈せず，常に緊密で散開状より寧ろ並行状着生の分枝並びに基底梗子を有している。

(1) 集落は著しいビロード状で，分生胞子柄は基質より特長的に一様に生育す。

Velutina Sub-section.

(1 ペニシラスは基底梗子より下位の分枝はせず，基底梗子は多少散開状，5°C, 37°C にて発育不能，坂口・王培地に発育す

P citrinum series

a 分生胞子は球形又は亜球形

1 集落は滲出物，裏面，周辺共大にて鮮黄色又は檸檬色調；ペニシラスは整斉双輪生状の如し

P citrinum Thom

2 集落は裏面にてくすんだ黄色又はオリーブ褐色，又時に淡褐色調，ペニシラスは幾分か散開型又は不規則様

P steckii Zaleski

a 2. 37°C に発育不能，集落は放射状の皺を有し，分生胞子は厚い外皮様は呈せず，裏面は赤色又は濃赤紫色調.

. . *P. atramentosum* Thom.

b 分生胞子は円筒形又は楕円，大きくサイズに振れがあり，又屡々超大型混在；ペニシラスは不規則且断片的，. . . *P. digitatum* series.

b-1. 集落の直径小で，分生胞子着生部はくすんだ黄緑色調.

. *P digitatum* Saccardo

b-2 集落は寧ろ直径大，分生胞子着生部は青緑色調.

. *P digitatum* Saccardo var *latum* Abe

b 3. 分生胞子は白色；他特性は同一様。

P. digitatum Sacc. var *californicum* Thom

2.》 分生胞子柄は粗面。

. . . *P. roqueforti* series

a. 分生胞子は球形，稀に亜球形；集落はノアヘック寒天にて常に平面或は僅少な皺を形成.

a-1. 分生胞子は滑面；分生胞子柄は疣状又は大顆粒状（06～01 μ 程度）の突起粗面；坂口・王培地によく発育；集落周縁部薄く且屡々蛛網状.

P roqueforti Thom.

a-2 分生胞子は少々刺状又は疣状突起粗面；分生胞子柄は斑点状或は小顆粒状；坂口・王培地では少しく発育；集落は寧ろ緻密で，集落周縁部は蛛網状を呈せぬ。

. *P. roqueforti* Thom var *punctatum* Abe.

b. 分生胞子は楕円又は卵形乃至亜球形；常に放射状皺を有す。

b-1 坂口・王培地上に発育せず。

1 分生胞子は楕円又は亜球形，滑面；裏面又は周辺寒天は常に著しく着色す。

P. casei Staub

2. 分生胞子は小刺状粗面，卵形又は亜球形，集落裏面は淡褐桃色，集落周辺寒天はミルク様呈色；ペニシラスは *P brevi-compactum* series の如し。

P. casei Staub var. *compactum* Abe

b 2 坂口・王培地にてよく発育；分生胞子は楕円又は卵形，少し大刺状又は疣状粗面 集落裏面又は周辺寒天は無色又は薄黄色調.

P. pseudo-casei Abe

B》 ペニシラスは比較的短く，緻密，各構成体は近接しておし合っている如し.

P brevi compactum series

1 分生胞子は球形又は亜球形，分岐又は基底梗子は一般的に膨脹状に着生.

P brevi-compactum Dierckx.

2 分生胞子は楕円又は亜球形，大刺状又は疣状粗面，集落は黄緑色調

P stoloniferum Thom

3 分生胞子は楕円又は亜球形 大刺状又は疣状粗面，集落は褐色調

P brunneo-stoloniferum Abe

（2） 集落は綿毛状で，束状又はロープ様菌糸はなく，ペニシラスは少ない。

..... .Lanata sub-section

A 集落は白色で，成熟期も同様で，順次灰緑色調になる。

. . . .*P. camemberti* series.

1. 集落は不明確な白色。

... .. *P. caseicolum* Bainier.

2 集落は 10～14 日以内に薄灰緑又は薄緑青色調を呈す。

. .... *P. camemberti* Thom.

B 集落は分生胞子着生部にて緑色調を速やかに呈す。

. . *P. commune* series.

1) 栄養菌糸は無色又集落裏面は無色又は薄黒紫色調，常に麦芽汁にては著しい分生胞子着生す。

a 分生胞子は球形，4.0 μ 以下，著しい粗面。

. *P. lanosum* Westling

b. 分生胞子は楕円又は順次亜球形，一般的に 4.0 μ 或は以上，滑面。

1. 分生胞子着生部輝黄緑色調。

... .*P lanoso viride* Thom.

2 分生胞子着生部は青緑乃至灰緑色調。

a 分生胞子着生部は青味強く，青緑色，厚い綿毛状。

P. lanoso-coeruleum Thom

3 分生胞子着生部は緑色乃至灰緑色調，順次オリーブ色調。

a 集落は強い放線菌様香気あり。

.. . .*P. biforme* Thom

b 集落は香気顕著ならず。

1. 集落は 300～1000 μ，菌糸帯を形成。

... . *P commune* Thom

2 集落は高い綿毛状，高さ 1～2 mm

... . *P. lanoso-griseum* Thom.

2) 栄養菌糸は少くとも基質に近接した附近では黄色又は橙色；集落裏面は橙色又は褐色；分生胞子着生無く，麦芽汁寒天にて僅少着生す。

a 集落の高さは 20～30 mm.，多少綿毛状，ツアペック，テイーブ寒天にては僅少な分生胞子の着生を示す .. *P aurantio-candidum* Dierckx

b 集落は薄く，明確な束状，ツアペック，スティーブ寒天上にて著しい分生胞子着生を示す

P aurantio-virens Biourge (in *P. viridi-cyclopium* series)

（3） 集落は気菌糸の集合にてロープ状又は紐状；分生胞子構成体は気菌糸又はロープ状菌糸より生育す Funiculosa Sub-section.

(1 分生胞子着生部は黄緑，青緑，又は灰緑色調，ペニシラスは大，Lanata, Fasciculata section と同一様，分生胞子柄は多少粗面，併し基底梗子，梗子は滑面

P terrestre series

A 集落裏面は無色或は薄黄乃至薄黄紫色調。

1 分生胞子鮮黄緑色調。

P. psittacinum Thom

2 分生胞子はくすんだ灰緑色調分生胞子柄は常に著しい粗面。

P. terrestre Jensen.

3 分生胞子は青緑色調，分生胞子柄は滑面。

P. solitum Westling

B 集落裏面濃黄色，赤色又は暗褐色調。

P. restriculosum Birk. Raist., and Smith.

(2 分生胞子着生部は各種帯色，緑色調は呈せず，ペニシラスは屢々比較的細く各構成体は側面に押された如し，分生胞子柄，基底梗子（屢々，梗子）は多少又は著しい粗面。

P. pallidum series

A 分生胞子白又はクリーム着色。

1 分生胞子連鎖は散開状，順次鎖状を呈す。

P. pallidum Smith

2 分生胞子連鎖は明確な円柱状。

P. putterillii Thom

B 分生胞子は薄い又はくすんだ灰色調。

P. namyslowskii Zaleski

C 分生胞子は薄黄色，赤桃色，薄紫桃色調。

P. lavendum Raper and Fennell

(4) 集落は束状又は括った如く分生胞子柄が束合しているために粉状，総状，束状又は結束糸状を呈す。

Fasciculata Sub-section.

a 菌核を特長的に形成す。

1 菌核は 25～30°C にて豊富に作るが低温では余り作らぬ，分生胞子柄は粗面。

P. gladioli series *P. gladioli* Machack

2 菌核或は被子器を或る菌株にて又は特殊な条件下で形成；分生胞子柄は滑面。

P. italicum Wehmer

b 菌核は不形成。

(A 集落は単一分生胞子柄と束状とが混り合っているが，単一分生胞子柄が常に豊富

(1. 集落の成熟分生胞子は真の緑色を呈せず。

P. ochraceum series

1. 分生胞子着生部は黄オリーブ色，薄オリーブ又は薄褐色調

P. ochraceum (Bainier) Thom

2 分生胞子着生部は薄褐色又は薄桃色調

P. carneo-lutescens Smith

3. 分生胞子着生部は無色或は薄クリーム色調。

P clavиforme & *P urticae* 及び他の species の変異株。

(2. 集落は特長的に成熟分生胞子着生部は黄緑，青緑，灰緑色調；37°C に発育不能。

1) 分生胞子柄は常に著しい粗面，坂口・王培地に発育不能。

A) 分生胞子は培養試験管，及器を少しく叩くのみで容易に壊れる如き外皮を形成す

...... *P. crustosum* series *P crustosum* Thom

B) 分生胞子は培養試験管或は器を軽く叩くのみでは容易に壊れぬ緻密な外皮を形成す。

... . *P. viridi-cyclopium* series

1-、分生胞子は球形又は亜球形，滑面。

a. 集落周辺寒天は常に速やかに又幅広く着色す。

1. 集落は輝黄緑色調或は順次薄褐色調。

.. *P. viridicatum* Westling

2 集落は青緑，少し青味を帯びた黄緑色，或はくすんだ黄緑色調。

. . *P. viridi-cyclopium* Abe

b 集落周辺寒天は無色或は遅く僅少着色す。

1. 集落分生胞子着生部は初め輝又はくすんだ黄緑色調しかし，速やかにオリーブ或は灰緑色調を呈す。

. . *P. olivino-viride* Biourge

2. 分生胞子着生部は速やかに暗黄緑色調。

.. *P. palitans* Westling

3 集落は青緑色調但し速やかに灰オリーブ色，僅かに束状又はビロード状様外観を呈す。

P. puberulum Bainier.

2-. 分生胞子は球形又は亜球形，大刺状又は疣状粗面。

1 集落は黄緑色調

P. palitans Westling var. *echinoconidium* Abe

2 集落は青緑色調。

. .. *P. cyclopium* Westling var. *echinulatum* Raper, Thom and Fennell.

3- 分生胞子は楕円又は卵形，滑面。

1 分生胞子は楕円又は卵形，集落は青緑色調

. *P. cyclopium* Westling

2 分生胞子は楕円形，麦芽汁寒天にては分生胞子未着生或は遅れて又は粗雑に発育す。

.. *P. aurantio-virens* Biourge

2) 分生胞子柄滑面 分生胞子楕円形

P. urticae & *italicum* series

a 坂口・王培地に不生育

1 胞子長さ 65μ 以下 *P urticae* Bainier

2　梗子長さ 65μ 以上。　　*P. expansum* (Link) Thom

b　坂口・王培地に生育。

1.　分生胞子は円筒形ではなく，集落は青緑色調。

. *P martensii* Biourge

2.　分生胞子は円筒形，集落は青或は黄緑色調。

. *P italicum* Wehmer

(B　集落は殆んどの分生胞子柄が束状又は結束糸状；37°C に発育不能。

A　分生胞子柄は粗面。

. *P. granulatum* series.

1　分生胞子は球形或は亜球形。

P corymbiferum Westling

2　分生胞子楕円形。

.. .*P. granulatum* Bainier.

B　分生胞子は滑面。

. *P. claviforme* series

1　集落は坂口・王培大ては幾分か生育す，結束糸は（ゴルフ使用）クラブ形で，稠密な繊維様の分生胞子柄と，分生胞子柄の塊りと交錯したペニシラスからなっている膨脹した所謂 (Sporehead) 胞子頭とは明らかに区別し得る。

1-1　分生胞子着生部は緑色調。

P. claviforme Bainier.

1-2　分生胞子着に無色。

P claviforme Bainier mut *caudicans* Abe & Ura.

1-3.　分生胞子はオリーブ色調。

P claviforme Bainier mut *olivicolor* Abe & Ura

2　坂口，王培地に良く生育，結束糸状で (Isaria-like) 刺状。屢々分生胞子柄と，ペニシラスは常に別れ羽毛状外観を呈する胞子頭 (Spore head) とは明確に区別し得ない。

P clavigerum Demelius.

Ⅲ　ペニシラスは特長的に整斉双輪生状，しかし時には或る菌種又は菌株にては断片的；梗子は槍鉾状で，先端は長く漸次に細く尖り，尖状　　Biverticillata-Symmetrica Section.

(1-　集落は被子器又は菌核を形成

A　集落は柔かい被子器形成，通常鮮黄色調　　*P luteum* series.

1　子嚢胞子通常著しい赤道様隆起す

a　菌株は高温性て，集落は薄桃色又はくすんだ灰緑色調，

P duponti Griffon and Moublane emend Emersom

b　菌株は高温性でない，集落は鮮黄又は緑黄色調，　　*P stipitatum* Thom

2　子嚢胞子は顕著な赤道様隆起を有せず

a　子嚢胞子は表面全体に小刺状粗面，子嚢は連鎖様に着生，

1　子嚢胞子は楕円

a-. 被子器は輝黄，金黄色又は檸黄色調。

1-. 子嚢胞子は長軸 40~50μ

aa 被子器の最初は伸長，長く，膨らみ分岐せず；集落は直径大。

.. .. *P. vermiculatum* Dangeard

bb. 被子器の初めは不規則に伸長，隔壁が出来，又屡々分岐す；集落は幾分か直径小。

. . . . . *P. wortmanni* Klocker

2- 子嚢胞子は長軸 30μ を超えぬ；被子器の初めは長く，螺旋状；集落の直径大

. .. .*P. helicum* Raper and Fennell

b-. 被子器は，白色，クリーム又は淡黄色調；被子器の初めは著しく膨脹し，屡々分岐して来る。

.. . . *P. spiculisporum* Lehman.

-2. 子嚢胞子は球形。

a-. 分生胞子は両端が幾らか尖った楕円形；被子器は金黄色又は檸黄色調。

..., . . . *P. rotundum* Raper and Fennell

b-. 分生胞子はバクテリア型又は棒状；被子器は淡黄色調。

.. .. .*P. bacillosporum* Swift

b. 子嚢胞子は表面全体小刺状粗面を呈せず；子嚢は營養菌糸より短く分岐したる如く単一に着生す。

1. 子嚢胞子は斑点状粗面；被子器は輝黄色調；分生胞子は淡桃褐色調。

. . . *P. avellaneum* Thom and Turesson

2. 子嚢胞子は著しい交叉帯を有し；被子器は輝黄色調。 .... *P luteum* Zukal

3. 子嚢胞子は多数の縦線様の隆起を有し；被子器は白色又はクリーム色調。

P. striatum Raper & Fennell

B. 集落は多く又は少なく菌核を形成。

1. 菌核は暗赤色又は黒色調、屡々伸脹す，ペニシラスは整斉双輪生状。

a 菌核は暗赤色或は赤黒色調，常に多少円形で，集落裏面の基質に着生する。

P. purpurogenum var. *rubri-sclerotium* Thom

b 菌核は黒色，褐黒色，或は緑黒色調，常に伸脹し，屡々多少基質に埋まっている。

1 菌核は豊富に作り，屡々特長的に；分生胞子柄又は基底梗子は著しい粗面，

P novae-zeelandiae v Beyma

2. 菌核は粗雑に又或る菌株では遅く形成，分生胞子柄及び基底梗子は滑面

, *P funiculosum* Thom

3 菌核形成、分生胞子柄長く且つ比較的粗雑な粗面。 *P. herquei* series

2 菌核は淡クリーム又は黄色調、円形，ペニシラスは双輪生状で、時に整斉的

P raistrickii Smith and allied species. (in Divaricata).

(2 集落は被子器及び菌核を形成せず

A 集落は直立した結束糸形成

1. 集落は 37 C によく生育，ペニシラスは整斉輪生状，梗子は箭鏃状，先端は次第に細くなっている；集落の裏面は黄橙 オリーブ褐色或は赤色調 *P. duclauxi* series

P duclauxi Delacroix

2. 集落は 37°C に生育不能；ヘニシラスは不整斉；梗子先端が急激に細い；集落裏面は赤色調を呈せず。 *P. claviforme* series

B 集落は結束糸を形成せず。

《1》 集落は 37°C に生育

-(A 集落表面は縄状，綿毛様縄状又は幾分か灰状；分生胞子柄は気菌糸又はロープ状菌糸より生育す。 . . *P. funiculosum* series.

(a 分生胞子連鎖は柱状又は散開状；基底梗子は並行状又は幾分か散開状。

(1. 分生胞子は楕円又は紡錘形，滑面，集落は裏面常に赤色調。

a)- 集落は坂口・王培地に発育不能、

1 集落は直径大；基底梗子並行状又は幾分か散開状。

P. funiculosum Thom

2 集落は多少直径小，菌叢ビロード状，菌糸赤，黄橙色調，分生胞子暗緑色；分生胞子紡錘形。

P. islandicum Sopp

b)- 集落は坂口・王培地によく発育；集落は常に直径大，基底梗子は多少散開状で，並行状ではない。

. *P. purpurogenum* var *rubri sclerotium* Thom (non sclerotigenic type)

(2 分生胞子は長楕円又は紡錘形にはならぬ，集落裏面は真の赤色調は呈せず。

1 分生胞子は球形又は卵形，疣状粗面。

. *P. verruculosum* Peyronel

2 分生胞子卵形又は時に楕円形，滑面或は僅少粗面；断片的ヘニシラスが多い；分生胞子柄はアスペルギルスの (foot cell) の如きものを形成。 *P varians* Smith

(b 分生胞子連鎖は円錐形又は角錐状塊形成，基底梗子は数多く且つ内側に曲っている。

P piceum Raper and Fennell

-(B 集落はビロード状又は羊毛状，分生胞子柄は基質又は基礎菌糸帯から生育。

P purpurogenum series

-(1 集落裏面は赤色調，分生胞子着生多く且つ黄，橙赤色気菌糸制限的に形成。

a) 集落周辺寒天に濃着色，分生胞子は楕円又は亜球形。

1 基底梗子は近接した並行状，集落発育やや早く，又時に直径大，分生胞子滑面又は僅少粗面。

P purpurogenum Stoll

2 基底梗子並行状ならず，常に多少散開状，集落は直径非常に，小，分生胞子滑面，

P rubrum Stoll

b) 集落周辺寒天に色素滲透せず，遅れて僅少は着色，集落直径やや大，

1) 分生胞子は大刺状又は瘤状粗面，

1 分生胞子は球形又は亜球形 *P aculeatum* Raper and Fennell

2 分生胞子は卵形 屢々一端が尖っている

P aculeatum Raper and Fennell var *apiculatum* Abe

2) 分生胞子は滑面，楕円；基底梗子は常に幾分か散開状；集落裏面は中心部又は中間部にて部分的に赤色調呈色。

1. 菌核形成；ビロード状又は僅少綿状菌叢。

. ..*P. purpurogenum* var. *rubri-sclerotium* Thom.

2. 新分離時も菌核不形成；ソアベック寒天にてビロード状，ステープ寒天にては明確な綿状

.. . 同上 (Non-sclerotigenic type)

-(2 集落裏面赤色調よりも赤橙，黄橙，又は緑褐色調；表面は常に黄色気菌糸豊富が特長。

.. ..*P. variable* Sopp

《2》 37°C にて発育不能，坂口・工培地に発育良好。

-(A 分生胞子柄は滑面；集落は寧ろ直径小；集落裏面は無色，部分的黄，橙褐色調，時には緑色調；集落周辺寒天は無色，部分的に濃く又は薄く着色；集落はビロード状又は類似菌叢。

. . . *P. rugulosum* series

1) 集落は直径小；分生胞子長軸 30μ 以上。

a. 集落裏面，全面又は部分的に橙褐色調，時には緑色調。

1. 分生胞子楕円形，大刺状又は疣状突粗面。 .. . *P. rugulosum* Thom

2. 分生胞子長楕円形，滑面又は僅かに粗面。 . . ... *P. concavo-rugulosum* Abe.

b 集落裏面常に全面無色又は黄色調；集落全面大変薄く，又中心部は幾分か綿毛状，屡々輪生状生育を示す。 . *P. tardum* Thom.

2) 集落直径非常に小；分生胞子は長軸にて 30μ 以下。

1. 基底梗子多くなく且つ幾分か散開状。 .. *P diversum* Raper and Fennell

2. 基底梗子多数且膨脹し恰も Divaricata のペニシラスの如し。

. . *P diversum* var. *aureum* Raper and Feuelnl

-(B 分生胞子柄は粗面；集落裏面は緑色又は緑褐色調ビロード状又は時には綿毛状，

(1 分生胞子柄直径 6～7μ 以下。

-a 分生胞子楕円形，

1 分生胞子は滑面，楕円形，ラグビーボールに類似型；基底梗子多く，且散開状様着生；分生胞子柄著しい粗面， *P. herquei* Bainier and Sartory.

2 分生胞子少し大刺状粗面；長軸 34μ 以下；集落直径大；基底梗子の着生散開状ならず。

P. paraherquei Abe.

3 分生胞子疣状又は顆粒状粗面，集落やや直径大。

.*P. estinogenum* Komastu and Abe.

-b 分生胞子球形又は亜球形，菌核時に豊富に形成。

P novae-zeelandiae van Beyma

(2 分生胞子柄，直径約 8μ *P olsoni* Bainier and Sartory

B ペニシラス 箒状にて，梗子の下位 3段以上分岐す Polyverticillata Section.

P. albicans seies.

P albicans Bainier.

Atlas and descriptions of *Penicillia*

2) 分生胞子は滑面，楕円；基底梗子は常に幾分か散開状；集落裏面は中心部又は中間部にて部分的に赤色調呈色。

1. 菌核形成；ビロード状又は僅少縄状菌叢。

..... *P. purpurogenum* var. *rubri-sclerotium* Thom

2 新分離時も菌核不形成；ツアペック寒天にてビロード状，ステープ寒天にては明確な縄状

... 同上 (Non-sclerotigenic type)

-(2. 集落裏面赤色調よりも赤橙，黄橙，又は緑褐色調；表面は常に黄色気菌糸豊富が特長。

. . .*P. variable* Sopp

《2》 37°C にて発育不能，坂口・王培地に発育良好。

-(A. 分生胞子柄は滑面，集落は寧ろ直径小；集落裏面は無色，部分的黄，橙褐色調，時には緑色調；集落周辺寒天は無色，部分的に濃く又は薄く着色；集落はビロード状又は類似菌叢。

. *P rugulosum* series

1) 集落は直径小；分生胞子長軸 30 μ 以上。

a 集落裏面，全面又は部分的に橙褐色調，時には緑色調。

1 分生胞子楕円形，大刺状又は疣状突粗面。 .... *P. rugulosum* Thom

2. 分生胞子長楕円形，滑面又は僅かに粗面。 ... *P. concavo-rugulosum* Abe.

b 集落裏面常に全面無色又は黄色調；集落全面大変薄く，又中心部は幾分か綿毛状，屡々輪生状生育を示す。 *P. tardum* Thom

2) 集落直径非常に小；分生胞子は長軸にて 30 μ 以下。

1 基底梗子多くなく且つ幾分か散開状。 . *P. diversum* Raper and Fennell

2. 基底梗子多数且膨脹し恰も Divaricata のペニシラスの如し。

. .*P. diversum* var. *aureum* Raper and Feuelnl

-(B 分生胞子柄は粗面；集落裏面は緑色又は緑褐色調ビロード状又は時には綿毛状，

(1. 分生胞子柄直径 6~7 μ 以下，

-a 分生胞子楕円形，

1 分生胞子は滑面，楕円形，ラグビーボールに類似型；基底梗子多く，且散開状様着生；分生胞子柄著しい粗面， *P. herquei* Bainier and Sartory.

2 分生胞子少し大刺状粗面，長軸 34 μ 以下；集落直径大；基底梗子の着生散開状ならず。

.. *P. paraherquei* Abe

3. 分生胞子疣状又は顆粒状粗面；集落やや直径大。

P. estinogenum Komastu and Abe.

-b. 分生胞子球形又は亜球形，菌核時に豊富に形成

.. *P. novae-zeelandiae* van Beyma.

(2 分生胞子柄 直径約 8 μ . . *P. olsoni* Bainier and Sartory

B ペニシラス 箒状にて，梗子の下位3段以上分岐す。 Polyverticillata Section.

P. albicans seies

.. . *P albicans* Bainier.

Atlas and descriptions of *Penicillia*

1. *Penicillium sclerotiorum* van Beyma.

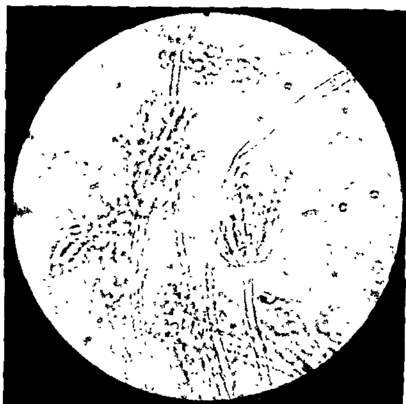


Fig. M-1. *Penicillium sclerotiorum* van Beyma, FAT 1181, detail of penicilli

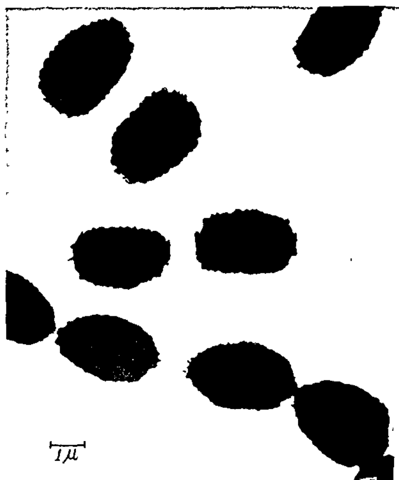


Fig E-1. *Penicillium sclerotiorum* van Beyma, FAT 1181, conidia showing the slightly rough walls and the elliptical form

ig. C-1 *Penicillium sclerotiorum* van Beyma, FAT 1181, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C に於て5日目約 15mm；10日目約 25mm (Fig C-1), 20日目, 約 56mm, 30°C, 10日目約 30mm；37°C, 発育不能；集落表面は鮮やかなオレンヂ赤色の菌糸に覆われた菌核で殆んど全面を占め, 胞子形成部は局部的に散在し, 青灰色, 滲出物は豊富, 鮮赤色；集落の裏面は黄色又はオレンヂ赤色, 集落周辺寒天は黄又はオレンヂ色；ペニシラス (Penicillus) は単輪生状 (Monoverticillate), (Fig M-1), 分生胞子連鎖は並行状, 又は幾分か円柱状, 長さ, 60～200μ, 菌核楕円又は亜球形, 180～400μ×150～300μ；分生胞子柄は基質又は気菌糸より生育し, 80～200μ×1 9～2 4μ, 先端膨大し 4 4～6 9μ, 平滑, 殆んど分岐せず；梗子, 8～14ケ, 並行状に群生, 8 1～12 5μ×1 9～2 5μ, 先端多少細い, 分生胞子, 楕円, 2 3～3 1μ×1 9～2 7μ, 平滑, 電子顕微鏡写真にては 0 1μ 以下の微小の粗面 (Fig E-1)。

スティフ寒天培養にては 25°C, 5日目約 17mm, 10日目 35～36mm, 20日目約 62mm, 30°C, 10日目約 38mm, 37°C, 発育不能。

集落裏面赤色を呈して来る, 他の特性は同上。

亜硝酸寒天培地にては発育不能。

本菌種は土壌中より得らる。

1. *Penicillium sclerotiorum* von Beyma.

Colonies on Czapek agar growing somewhat restrictedly, attaining a diameter of about 25mm in 10 to 12 days at 25°C, 30 mm at 30°C; not grew at 37°C; (growing little or not on NO_2-medium, variable in color and texture, depending upon the relative abundance of sclerotia, vegetative hyphae, and conidial structures, varying from essentially conidial presenting a velvety appearance, through more or less floccose from the development of abundant vegetative mycelium, to predominantly sclerotia with limited development of fruiting structures or of aerial vegetative hyphae, frequently showing these different aspects as sectors in the same colony; conidial structures limited or abundant, at first arising primarily from the substratum and en masse producing areas near artemesia green or glaucous shades, in age often developing from aerial hyphae over the entire colony surface, vegetative mycelium in flame scarlet or grenadin red shades; sclerotia uncolored or nearly so, typically borne in fairy definite clusters surrounded by evelopes of sterial encrusted hyphae in fairy definite bright orange red shades near scarlet to brazil red (Fig C-1), exudate abundantly produced, English red or flame scarlet; odor slight, suggesting mush rooms; reverse in yellow to orange red shades, surrounding agar pigmented in deep chrome shades penicilli strictly monoverticillate (Fig M 1), bearing conidia in parallel chains forming loose columns up to 60 to 200 μ in length; sclerotia elliptical or subglobose, mostly 180 to 400 μ by 150 to 300 μ, conidiophores arising from the substratum or from aerial hyphae, seldom branched, smooth or nearly so walled, up to 80 to 200 μ in length by 1 9 to 2 4 μ, enlarging in terminal areas to vesicular apices 4 4 to 6 9 μ in diameter; sterigmata parallel in croweded cluster of 8 to 14, mostly 8 1 to 12 5 μ by 1 9 to 2 5 μ, with conidium bearing tips somewhat narrowed; conidia elliptical, mostly 2 3 to 3 1 μ by 1 9 to 2.7 μ, smooth or nearly so walled, and slightly roughen walls are shown by electron microscopy (Fig E-1)

Colonies on steep agar slightly larger on Czapek, growing about 35 to 36 mm in 10 to 12 days at 25°C, 38 mm at 30°C, seldom growing at 37°C, reverse becoming reddish shades near Mahogany Red, the other characters as on Czapek

Strains of this species occurs soils

*van Beyma, F H Zentbl F Bakt II, 96 416 419, fig 1 and 2 1937

**Raper, K B, Thom, C and Fennell, D I, A Manual of the Penicillia, 160 163 1949

***Abe S, J Gen Appl Microbiology p 49 1956

2. *Penicillium thomii* Maire



Fig. M-2. *Penicillium thomii* Maire, FAT 388, detail of Penicilli

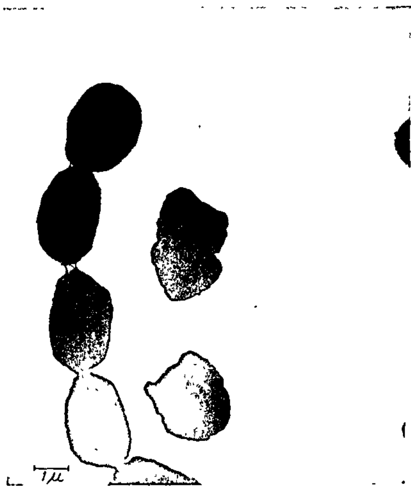


Fig E-2 *Penicillium thomii* Maire, FAT 388, con smooth or nearly so walls and the elliptical to for

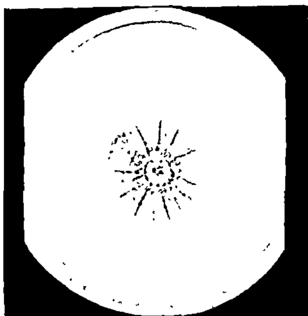


Fig. C-2. *Penicillium thomii* Maire, FAT 388, on Czapek agar, 10 days

ツァペック寒天培養にては 25°C, 5日目約19 mm, 10日目約37 mm (Fig C-2), 20日目約50 mm; 30°C, 10日目約54 mm, 37°C, 10日目約37 mm; 集落表面は著しい皺があり，菌叢はビロード状又は幾分か綿毛状，分生胞子着生部は中心部又は局部的か或は僅かに全面にあり，淡青緑色，又は灰緑色を呈す，桃色或は黄又はオレンヂ色の菌核は固く，長楕円又は円形，280～440μ×210～350μ，集落全面又は局部的に形成し，屢々人工培地に長く保存する場合は形成不能になる，滲出物は或る菌株にては豊富，他菌株にては不形成，黄又は橙色，集落裏面は黄，橙，桃褐，赤褐色を呈し，集落周辺寒天は淡黄色；ペニシラスは単輪生状 (Fig M-2)，分生胞子連鎖，幾分か円柱状，長さ，60～250μ，分生胞子柄は基生菌糸又は気中菌糸より発育，殆んど分岐せず，柄壁僅かの突起粗面，100～400μ×2 8～3 6μ，先端膨大し 3 0～5 4μ，梗子 7～10ヶ幾分か並行状に群生，7 5～10μ×1 8～2 6μ，先端幾分か細い，分生胞子楕円又は亜球形，2.5～3 6μ×1 5～2 8μ，平滑，電子顕微鏡写真 (Fig E-2) にても滑面。

スティープ寒天培養にては 25°C 5日目約 25 mm 10日目約 45 mm 20日目約 54 mm, 30°C 10日目約 50 mm, 37°C, 10日目約 38 mm, 他の諸特性同 |

亜硝酸寒天培養にては良好な発育を示す

本菌種は土壌，木，及び病変米より分離される。

2 *Penicillium thomii* Maire

Colonies on Czapek agar growing rapidly in most strains attaining a diameter of about 37 mm in 10 to 12 days at 25°C (Fig C-2); 54 mm at 30°C; 37 mm at 37°C; (growing fairly well on NO_2 medium), conspicuously furrowed, velvety or subfloccose texture, consisting of a tough basal felt with surface appearing loose to slightly floccose, white to pale blue-green, sporulating lightly *throughout but more abundantly in central colony* areas and in localized sectors, in gray-green shades near artmesia green, sometimes producing abundant, hard, rounded to oblong, pink or yellow, orange sclerotia up to 280 to 440 μ by 210 to 350 μ throughout the colony area, sometimes in limited sectors only, and often failing to develop sclerotia, especially in strains long maintained in artificial culture, exudate abundantly produced in some strains, yellow to orange shades not in others; odor slight, suggesting mushrooms; reverse in yellow or orange to pinkish brown shades with surrounding agar pale yellow pigmented; penicilli strictly monoverticillate (Fig M-2), bearing conidial chains usually in loose columns up to 60 to 250 μ in length, conidiophores arising from the basal felt and from interlacing aerial hyphae, seldom branched, with walls delicately echinulate, variable in length up to 100 to 400 μ by 2 8 to 3 6 μ with apices enlarged, somewhat vesicular about 3 0 to 5 4 μ in diameter, sterigmata loosely parallel, *commonly 7 to 10 in the vertical, usuall 7 5 to* 10 μ by 1 8 to 2 6 μ with conidium bearing tips somewhat narrowed, conidia elliptical to subglobose, mostly 2 5 to 3 6 μ by 1 5 to 2 8 μ, smooth or nearly so walled, and the smooth or nearly so walls are shown by electron microscopy (Fig E-2)

Colonies on steep agar spreading broadly, about 45 mm or more in 10 to 12 days at 25°C, 50 mm. at 30°C, about 38 mm at 37°C, the other characters are as described above

Strains of this species occurs from wood, soils and diseased rice

*Maire R, Bul Soc Hist Nat Afrique du Nord 8 189-192 1917

**Thom, C, The Penicillia, P 173 1930, U S Dept Agr, Bur Anim Ind Bul 118 p 78 1910

***Raper K B Thom C and Fennell, D I, A Manual of the Penicillia 156 160 1949

****Abe, S, J Gen Appl Microbiology pp 50 51 1956

3. *Penicillium purpurrescens* (Sopp) Raper, Thom and Fennell.



Fig. M-3A. *Penicillium purpurrescens* (Sopp) Raper, Thom and Fennell, FAT 732, low power view of colony section showing typically character of texture.

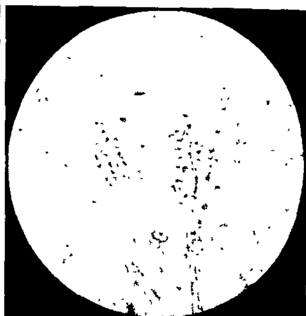


Fig. M-3B. *Penicillium purpurrescens* (Sopp) Raper, Thom and Fennell, FAT 832, detail of penicilli



Fig. E-3. *Penicillium purpurrescens* Sopp Raper, Thom and Fennell, FAT 559, conidia showing the conspicuously echinulate or verruculose walls and the globose to subglobose form

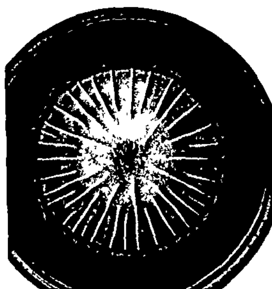


Fig. C-3. *Penicillium purpurrescens* (Sopp) Raper, Thom and Fennell, FAT 732, on Czapek agar, 10 days.

ツァペック寒天培養に於ける集落の発育は 25°C 5日目 23～34 mm，10日目 50～70mm (Fig C-3), 20日目64～74 mm,; 30°C, 10日目 47～56 mm，37°C, 発育不能，或る菌株にては輪生状に発育，放射状の皺があり，菌叢はビロード状，分生胞子着生部の呈色は暗又は濃青緑色或は青灰緑色，滲出物は欠又は僅小，褐色又は赤色；集落裏面は濃赤色或は褐色，集落周辺寒天は無色又は黄又は淡桃色，分生胞子柄は殆んど基質より直立し (Fig M-3A), 60～250μ×2 1～3 5μ, 先端幾分か膨大し 3 1～5 0μ, 平滑，ペニシラスは単輪生状で，時として分岐し，分生胞子連鎖は幾分か円柱状，長さ 60～280μ，梗子，5～13ケ緻密或は幾分か緻密に群生，屡々分生胞子柄頂端の下部に着生，7～13μ又は 15μ×2 1～3 5μ (Fig M-3B), 分生胞子球形又は亜球形，2 5～4 6μ 大 5 5μ，著しい粗面，又電子顕微鏡写真 (Fig. E-3) にても著しい刺状又は疣状を呈す。

スティープ寒天培養に於ける，25°Cの集落の発育は 5日目 32～36mm，10日目 60～82mm，20日目，72～8 2mm，30°C, 10日目 57～62 mm，37°C, 発育不能，他の諸特性は同上。

亜硝酸寒天培地にてはやゝ発育良好である。

本菌種は屡々土壌，病変米，土壌腐敗物等より分離さる。

3. *Penicillium purpurrescens* (Sopp) Raper, Thom and Fennell

Colonies on Czapek agar attaining a diameter of 5 0 to 7 0 cm. in 10 to 12 days at 25°C, 47 to 56 mm at 30°C, seldom growed at 37°C, (growing fairly well or slightly sporulating on NO_2-medium), conspicuously zonate in some strains, almost a-zonate in others, radiately wrinkled, velvety or nearly so, conidial areas in dark blue green or dark bluish gray green, and dark olive green shades, exudate lacking to limited, light amber to reddish, odor indefinite, reverse in Brazil Red or Brown shades, surrounding agar uncolor to yellow or pale pink (Fig C-3); conidiophores generally arising in a close stand directly from the substratum (Fig M 3A) mostly 60 to 250 μ long by 2 1 to 3 5 μ in diameter, smooth or nearly so walled, enlarging somewhat at the apices to 3 1 to 5 0 μ; penicilli strictly monoverticillate as a rule, sometimes branched, bearing chains of conidia in loose columns up to 60 to 280 μ long, sterigmata mostly in groups of 5 to 13, crowded in the verticil, compact or loosely compact, often arising low on the sides of the vesicular area, 7 to 13 μ or 15 μ by 2 1 to 3 5 μ (Fig M-3B), conidia globose to subglobose, mostly 2 5 to 4 6 μ, some larger up to 5 5 μ, conspicuously roughed walled, and conspicuously echinulate or verruculose walls are shown by electron microscopy (Fig E-3)

Colonies on steep agar about 60 to 82 mm in diameter in 10 to 12 days at 25°C, predominantly velvety, the other characters are as described above

Strains of this species are occasionally isolated from soil or contaminated materials and disease rice

* Sopp, O Monogr p p 117 119, Taf XIV, fig 102 Taf XXII, fig 4 1912
** Thom, C, The Penicillia p 179 1930
*** Reper, K B, Thom, C and Fennell, D I, A Manual of the Penicillia, p p 177-180 1949
**** Abe, S, J Gen Appl Microbiology, p p 52 53

4. *Penicillium spinulosum* Thom.

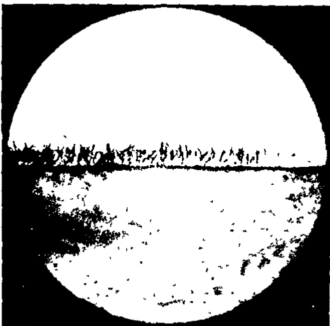


Fig. M-4 A. *Penicillium spinulosum* Thom, FAT, 621, low power view of colony section showing typically velvety character of texture.



Fig. M-4 B. *Penicillium spinulosum* Thom, FAT 621, detail of penicilli

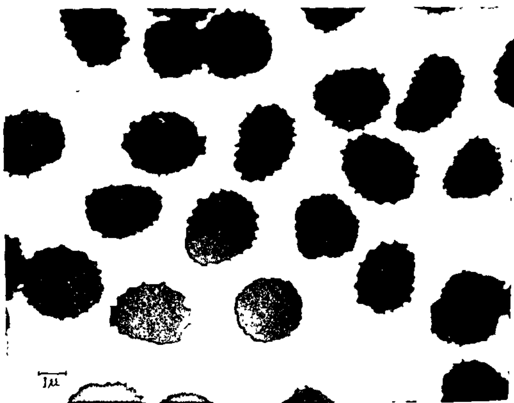


Fig. L-4 *Penicillium spinulosum* Thom FAT 1137, conidia showing the spinulose walls and the globose to subglobose form

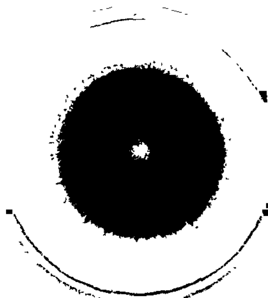


Fig C-4. *Penicillium spinulosum* Thom, EAT 621, on Czapek agar, 10 days

ソアペック寒天培養の集落の発育は25°Cにて，5日目28～45 mm.；10日目，66～76 mm (Fig C-4)；20日目75～80 mm；30°C，10日目50～72 mm；37°C，発育不能；菌叢，ビロード状，(Fig M-4A) 又は類似，或る菌株にては綿毛（羊毛）状，縄状，集落表面平滑又は放射状の皺があり，時として頭脳状の皺があり，約1 0～3 0 mmの白色の周辺部を有し，中心部の高さは700～1000μ で或る菌株は胞子の着生が多く，又或る菌株は僅小であり，分生胞子着生部は暗又はくすんだ緑色であり，濃黄緑色，濃青緑色で順次オリーブ色を呈す；滲出物は欠或は非常に僅小，無色；集落裏面は無色又は薄黄，桃色で15～30日目は屡々紫色を呈し，集落周辺寒天は無色；ペニシラスは単輪生状 (Fig. M-4B)；分生胞子柄はその直立場所により各種で，60～380μ×1 8～3 9μ，頂端部膨大し3 0～5 0 又は 8.4μ，多くの菌株は平滑，或る菌株にては僅小の斑点状粗面，梗子は6～10ケ輪盃に群生し，7 9～11 4μ 又は 13μ×2 0～3 1 又は 3 7μ，分生胞子，球形又は亜球形，2 1～3 2 又は 4 0μ，小刺状粗面 (Spinulose)，又は電子顕微鏡写真 (Fig E-4) にても小刺状粗面，分生胞子連鎖は円柱状，又は類似，長さ 60～230μ.

スティープ寒天培養に於ける集落の発育は25 C に於て5日目28～50 mm，10日目65～80 mm，20日目75～80 mm，30°C，10日目55～79 mm，37 C，発育不能，他の諸特性は同上。

亜硝酸寒天培養に於ては良好な発育を示す

本菌種は土壌又は乾燥柿より分離さる。

4. *Penicillium spinulosum* Thom

Colonies on Czapek agar growing fairly rapidly or broadly, 66 to 76 mm. in 10 to 12 days at 25°C (Fig. C-4); 50 to 72 mm at 30°C; seldom growing at 37°C; (growing very well on NO_2-medium), usually typically velvety or velutinous (Fig M-4A), floccose or funiculose textured in some strains; smooth or radial furrowed, sometimes cerebriform furrowed, white margin 1 0 to 3 0 mm wide; colony depth 700 to 1000 μ in central area, heavily sporing in some strains, lightly in others, in dark or dull green shades near Dusky Yellowish Green, Dark American Green, Dark Russian Green, becoming similar or olive green shades; odor very faint; exudate lacking or very limitedly, colorless; reverse colorless or pale yellow, pinkish shades, becoming occasionally violet shades near Violet Slate or Deep Slate Violet in 15 to 30 days, with surrounding agar seldom pigmented, penicilli strictly monoverticillate bearing spore chains in columns or loosely columns up to 60 to 230 μ long (Fig M-4B); conidiophores varying in relation to their origin, mostly 60 to 380 μ long by 1 8 to 3 9 μ, with apices vesicular up to 3 0 to 5 0 or 8 4 μ in diameter, with walls almost smooth or nearly so in some strains to slightly punctate in others, sterigmata comparatively few in the verticil, about 6 to 10, compact, measuring mostly 7 9 to 11 4 or 13 μ by 2 0 to 3 7 μ, acute type with smooth or nearly so walls; conidia globose to subglobose, mostly 2 1 to 3 2 or 4 0 μ in diameter, with spinulose walled, and also spinulose walls are shown by electron microscopy (Fig E 4)

Colonies on steep agar growing more rapidly, about 65 to 80 mm in 10 to 12 days at 25°C; 55 to 79 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species are isolated frm soils and drying persimmon

* Thom, C, U S Dept Agr, Bur Anim Ind Bul 118, p 76, fig 32, 1910, The Penicillia p p 183-184, fig 21 1930

** Raper, K B, Thom C and Fennell D I, A Manual of the Penicilla, p p 180 185 1949

*** Sakaguchi, K, Japanese Assoc of Adv Sci No 6 726 739 1930

**** Abe, S, J Gen Appl Microbiology p 53 1956

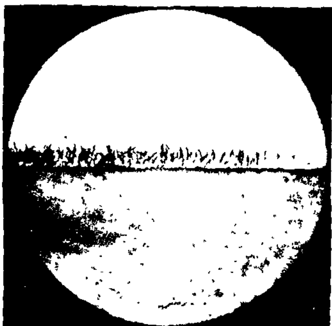


Fig. M-4 A. *Penicillium spinulosum* Thom, FAT, 621, low power view of colony section showing typically velvety character of texture



Fig. M-4 B. *Penicillium spinulosum* Thom, FAT 621, detail of penicilli

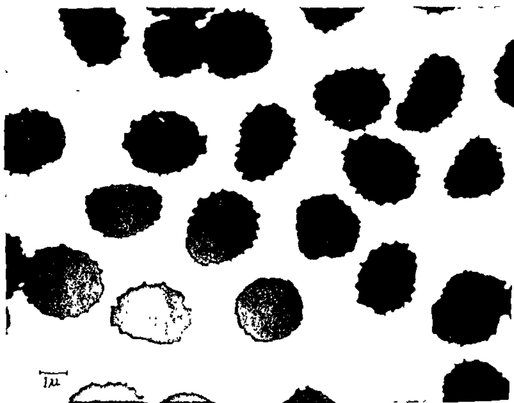


Fig I-4. *Penicillium spinulosum* Thom FAT 1137, conidia showing the spinulose walls and the globose to subglobose form

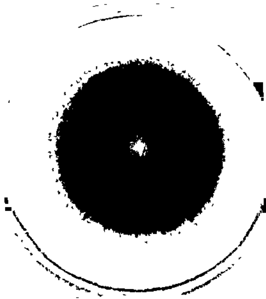


Fig. C-4. *Penicillium spinulosum* Thom, EAT 621, on Czapek agar, 10 days

ツアペック寒天培養の集落の発育は25°Cにて，5日目28~45 mm，10日目，66~76 mm (Fig C-4)；20日目75~80 mm，30°C, 10日目50~72 mm；37°C, 発育不能；菌叢，ビロード状，(Fig. M-4A) 又は類似，或る菌株にては綿毛（羊毛）状，縄状，集落表面平滑又は放射状の皺があり，時として頭脳状の皺があり，約1 0~3 0mmの白色の周辺部を有し，中心部の高さは700~1000μで或る菌株は胞子の着生が多く，又或る菌株は僅小であり，分生胞子着生部は暗又はくすんだ緑色であり，濃黄緑色，濃青緑色で順次オリーブ色を呈す；滲出物は欠或は非常に僅小，無色；集落裏面は無色又は淡黄，桃色で15~30日目は屡々紫色を呈し，集落周辺も又は無色；ペニシラスは単輪生状 (Fig M-4B)，分生胞子柄はその直立場所により各種で，60~380μ×1 8~3 9μ，頂端部膨大し3 0~5 0 又は 8 4μ，多くの菌株は平滑，或る菌株にては僅小の斑点状粗面，梗子は6~10ケ輪生に群生し，7 9~11 4μ又は13μ×2 0~3 1又は3 7μ，分生胞子，球形又は亜球形，2 1~3 2又は4 0μ，小刺状粗面 (Spinulose)，又は電子顕微鏡写真 (Fig E-4) にても小刺状粗面，分生胞子連鎖は円柱状，又は類似，長さ 60~230μ

スティーブ寒天培養に於ける集落の発育は25°C に於て5日目28~50 mm，10日目65~80 mm，20日目75~80 mm，30°C, 10日目55~79 mm，37°C, 発育不能，他の諸特性は同上。

亜硝酸寒天培養に於ては良好な発育を示す。

本菌種は土壌又は乾燥柿より分離さる。

4. *Penicillium spinulosum* Thom

Colonies on Czapek agar growing fairly rapidly or broadly, 66 to 76 mm in 10 to 12 days at 25°C (Fig C-4), 50 to 72 mm. at 30°C; seldom growing at 37°C, (growing very well on NO_2-medium), usually typically velvety or velutinous (Fig. M-4A), floccose or funiculose textured in some strains; smooth or radial furrowed, sometimes cerebriform furrowed, white margin 1 0 to 3 0 mm. wide; colony depth 700 to 1000 μ in central area, heavily sporing in some strains, lightly in others, in dark or dull green shades near Dusky Yellowish Green, Dark American Green, Dark Russian Green, becoming similar or olive green shades, odor very faint; exudate lacking or very limitedly, colorless; reverse colorless or pale yellow, pinkish shades, becoming occasionally violet shades near Violet Slate or Deep Slate Violet in 15 to 30 days, with surrounding agar seldom pigmented; penicilli strictly monoverticillate bearing spore chains in columns or loosely columns up to 60 to 230 μ long (Fig M-4B), conidiophores varying in relation to their origin, mostly 60 to 380 μ long by 1 8 to 3 9 μ, with apices vesicular up to 3.0 to 5 0 or 8 4 μ in diameter, with walls almost smooth or nearly so in some strains to slightly punctate in others; sterigmata comparatively few in the verticil, about 6 to 10, compact, measuring mostly 7 9 to 11 4 or 13 μ by 2 0 to 3 7 μ, acute type with smooth or nearly so walls, conidia globose to subglobose, mostly 2 1 to 3 2 or 4 0 μ in diameter, with spinulose walled, and also spinulose walls are shown by electron microscopy (Fig E-4)

Colonies on steep agar growing more rapidly, about 65 to 80 mm in 10 to 12 days at 25°C, 55 to 79 mm at 30°C; seldom growing at 37°C, the other characters as on Czapek

Strains of this species are isolated frm soils and drying persimmon.

* Thom, C, U S Dept Agr, Bur Anim Ind Bul 118, p 76, fig 32, 1910, The Penicillia, p p 183 184, fig 21 1930

** Raper, K B, Thom, C and Fennell D I, A Manual of the Penicilla, p p 180 185 1949

*** Sakaguchi, K, Japanese Assoc of Adv Sci No 6 726 739 1930

**** Abe, S, J Gen Appl Microbiology p 53 1956

5. *Penicillium lilacino-echinulatum* Abe

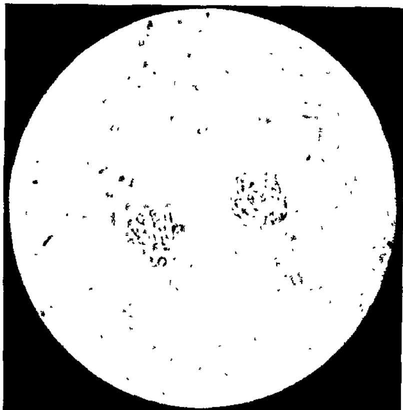


Fig. M-5. *Penicillium lilacino echinulatum* Abe, FAT 84, detail of penicilli

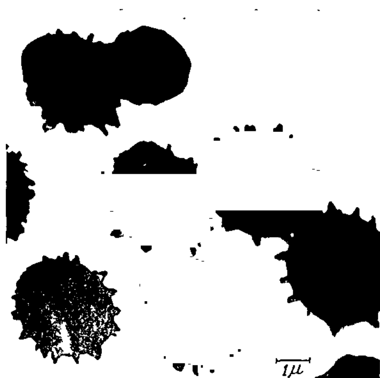


Fig E-5 *Penicillium lilacino echinulatum* Abe, FAT 84 conidia showing the conspicuously echinulate or verruculose walls and the globose to subglobose form

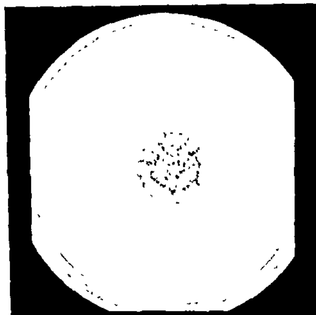


Fig. C-5. *Penicillium lilacino-echinulatnm* Abe, FAT 84, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は25°C, 5日目約16 mm, 10日目約30 mm (Fig C-5), 20日目約42 mm；30°C, 10日目37 mm；37°C, 発育不能，集落表面に溝があり中心部隆起, 菌叢は縄状, 分生胞子着生部は淡灰青緑色又はオリーブ灰色；滲出物は豊富, 無色，集落裏面は6～7日淡紫色順次黄色を呈し, 周辺寒天は淡黄色，ペニシラスは単輪生状 (Fig. M 5)；分生胞子柄 20～40 μ×1 2～1 9 μ, 平滑, 頂端膨大, 3 0～6 2 μ, 梗子緻密に6～15ヵ群生, 5 0～7 0 μ又は稀れに 9 3 μ×1 5～2 5 μ, 平滑面，分生胞子球形又は亜球形, 大刺又は疣状突起粗面, 2 1～2 8 μ，分生胞子連鎖は並行状又は幾分か円柱状, 長さ 30～60 μ；分生胞子の電子顕微鏡写真 (Fig. E-5) も著しい大刺又は疣状突起粗面。

スティープ寒天培養に於ける 25 C の集落発育は5日目約18 mm, 10日目約37 mm, 20日目約54 mm 30°C, 10日目約40mm，37 C, 発育不能，他の諸特性同上。

亜硝酸寒天培養にては発育不能。

本菌種は土壌より分離さる。

5 *Penicillium lilacino-echinulatum* Abe.

Colonies on Czapek agar rather restrictedly, about 30 mm in 10 to 12 days at 25°C; 37 mm at 30°C; seldom growing at 37°C; (growing little or not on NO_2-medium), the central area is raised, and sulcate, the surface appearing typically funiculose, in pale gray green shades near Mineral Gray or Pale Olive Gray, changing to Tea Green, with a white margin 0.2 to 0.5 mm in wide (Fig C-5); exudate abundant, colorless, reverse in near Light Vinaceous Lilac in 6 to 7 days, changing to yellow shades, and the surrounding agar in pale yellow shades; penicilli strictly monoverticillate (Fig M-5), conidiophores short, up to 20 to 40 μ in length by 1 2 to 1 9 μ in diameter, with walls smooth or nearly so, and apices enlarged up to 3 0 to 6 2 μ in diameter, sterigmata in crowded clusters, compact, numbering 6 to 15 in a verticil, mostly 5 0 to 7 0 μ or rarely 9 3 μ in length by 1.5 to 2 5 μ in diameter, acute type with smooth walls or nearly so; conidia globose to subglobose, with typically echinulate or verruculose walls 2 1 to 2 8 μ in diameter; chains of chaidia in parallel or loose columns, commonly up to 30 to 60 μ in length, and conidia showing conspicuously echinulate or verruculose walls in electron microscopy (Fig E-5)

Colonies on steep agar are restricted, growing to about 37 mm in 10 to 12 days at 25°C, 40 mm at 30 C, seldom growing at 37°C, the other characters are as described above

Strains of this species are isolated from soils in Japan

*Abe S., J Gen Appl Microbiology p 54 1956



6. *Penicillium frequentans* Westling.



Fig. M-6A. *Penicillium frequentans* Westling, FAT 627, low power view of colony section showing velvety character of texture.



Fig. M-6B. *Penicillium frequentans* Westling, FA 627, detail of penicilli

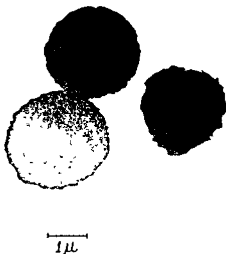


Fig. E-6 *Penicillium frequentans* Westling, FAT 103, conidia showing the slightly rough walls and the globose to subglobose form

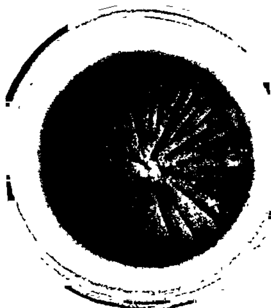


Fig. C-6. *Penicillium frequentans* Westling, FAT 627, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C にて 5 日目 20～40 mm ; 10 日目 59～75 mm. (Fig C-6) ; 20 日目 70～80 mm ; 30°C, 10 日目 47～64 mm ; 37°C. 発育不能, 菌叢はビロード状 (Fig M-6A) 又は類似, 或は菌株により綿状, 集落表面は平滑又は放射状の皺があり, 或る菌株にては中心部が隆起, 分生胞子着生部は暗或は濃青緑色或は濃黄緑色を呈し, 同様又は灰オリーブ色を呈し, 集落円周部は 10～20 mm 幅 白色 ; 集落裏面は黄橙, 褐色, 時々紫褐色，集落周辺寒天は無色或は淡黄, 桃色，ペニシラスは単輪生状 (Fig M-6B)，分生胞子柄 ; 着生点により異るが, 40～400 μ×2 5～3 6 又ハ 4 3 μ, 頂端部膨大, 3 2～5 0 或は 8 5 μ, 滑面，梗子 5～14 カ緻密に群生し, 8 4～12 μ×2 1～4 0 μ，分生胞子連鎖, 円柱状, 長さ, 60～380 μ 或は以上，分生胞子, 球形又は亜球形 2.1～3 8 μ, 滑面, 又電子顕微鏡写真 (Fig E-6) にては 0 1 μ 以下の微小の粗面。

スティープ寒天培養 25°C, 5 日目の集落の発育は 25～47 mm， 10 日目 63～77 mm, 20 日目 76～84 mm ，30°C 10 日目, 57～71 mm ，37°C 発育不能，ツァペック寒天培養より一層分生胞子着生多く且つ集落裏面も一層濃い呈色を示し, 他の諸特性は同上。

亜硝酸寒天培養にては発育不能。

本菌種は腐敗野菜, 乾燥物 土壌等より分離され, ペニシリューム属中最も分布の広範囲の菌種の一つである。

6. *Penicillium frequentans* Westling

Colonies on Czapek agar rather broadly, 59 to 75 mm in 10 to 12 days at 25°C, 47 to 64 mm. at 30°C; seldom growing at 37°C; (growing little or not on NO_2-medium); usually typically velvety or velutinous textured (Fig M-6A) funiculose in some strain, smooth or radiately wrinkled in most strains, central area is raised in some strains, in dark bluish green or dark yellow green shades near Dark Russian Green, Dark American Green, Dusky Yellowish Green, becoming similar or grayish olive shades, with a white margin about 1 0 to 2 0 mm. in wide (Fig C-6), exudate lacking or limitedly, clear to light brown, odor faint, moldy; reverse mostly in shades of yellow-orange near Mars Yellow to Xanthine Orange, Amber Brown, but in occasional strains appearing light purplish brown and the surrounding agar colorless or pale yellow or pinkish shades; penicilli strictly monoverticillate (Fig M-6B), conidiophores varying in relation to their origin, mostly 40 to 120 to 400 μ in length by 2.5 to 3 6 or 4.3 μ, with apices vesicular up to 3 2 to 5 0 or 8 5 μ in diameter, with smooth or nearly so walled, sterigmata in compact clusters numbering 5 to 14 in the verticil, mostly 8 4 to 12 0 μ by 2 1 to 4 0 μ, commonly producing chains of conidia in fairly well defined columns up to 60 to 380 μ or more in length, conidia globose to subglobose mostly 2 1 to 3 8 μ with smooth or nearly so walled, and slightly rough walls are shown by electron microscopy (Fig E-6)

Colonies on steep agar slightly larger than on Czapek, growing about to 63 to 77 mm. in 10 to 12 days at 25°C, 57 to 71 mm at 30 C, seldom growing at 37°C, heavily sporing, color in reverse deeper and somewhat more intense than on Czapek, the others characters as on Czapek

Strains of this species are isolated from soils and decaying vegetable matter, drying materials, and represents one of the most abundant and widely distributed of all the *Penicillia*

* Westling, R Arkiv for Botanik II 53, 133 134, figs, 39, 78 1911

** Biourge, Ph, La Cellule, 33 Fasc I, pp 292 293, Col Pl X and Pl XVII, fig 99 1923

*** Thom, C, The Penicillia pp 216 217 1930

**** Raper, K B, Thom, C and Fennell, D I, A Manual of the Penicillia pp 172 177 1949

***** Abe, S J Gen Appl Microbiology 55 56 1956

7. *Penicillium citreo-viride* Biourge

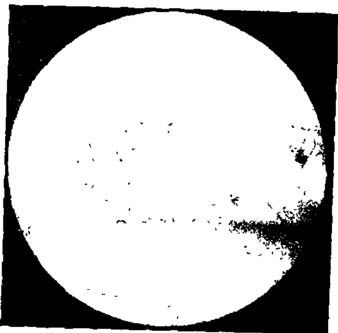


Fig. M-7A. *Penicillium citreo-viride* Biourge, FAT 970, detail of penicilli

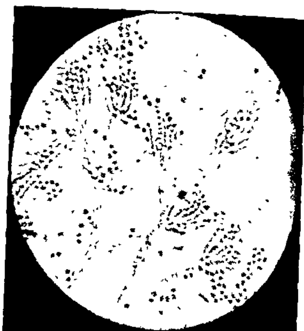


Fig. M-7B. *Penicillium citreo-viride* Biourge, FAT 568, low power view of colony section showing typically velvety character of texture

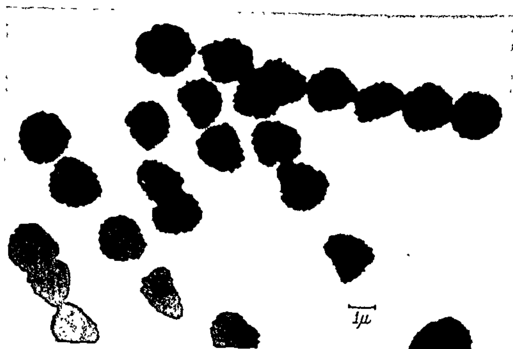


Fig. E-7. *Penicillium citreo-viride* Biourge, FAT 959, conidia showing the slightly rough walls and the globose to subglobose form

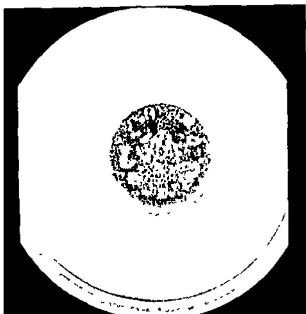


Fig C-7. *Penicillium citreo viride* Biourge, FAT 970, on Czapek ager, 10 days

ツァペック寒天培養における集落の発育は 25°C にて5日目約11~20mm，10日目20~36 mm (FigC-7) 20日目 34~56mm；30°C 10 日目 22~37mm，37°C 発育不能，菌叢はビロード状又は類似 (Fig M 7A)，或は菌株により綿毛状又は縄状，集落表面は平面又は平滑或は著しい皺，又はもり上った形状をなし，菌糸は黄色，集落円周部は 0 2~1 5 mm 巾，白色，分生胞子着色部は青緑，濃青緑，黄緑，青灰緑色，滲出物は僅小又は豊富，淡又は著しい鮮黄色，集落裏面及び集落周辺寒天は鮮黄色又は淡黄色，ペニシラスは単輪生状，(FigM-7B) 屡々分岐，分生胞子柄は基質又は匍匐菌糸，分岐状菌糸より発育，30~90μ×1 2~3 0μ，頂端膨大，2 3~3 8μ，滑面，梗子4~12箇宛に群生，6 8~9 4μ×1 2~2 5μ，分生胞子 球形 又は亜球形，1 2~2 2，大．3 0μ，滑面，電子顕微鏡写真 (Fig E-7) にては 0 1μ 以下の僅小粗面，分生胞子連鎖，幾分か並行状，円柱状，長さ 30~100μ

スティープ寒天培養にての集落の発育は25 C，5日目16~21mm，10日目，26~45 mm，20日目 40~55 mm，30°C，10日目 24~41 mm，37C°，発育不能，他の諸性質は同上。

亜硝酸寒天培養にては良好なる発育を示す。

本菌種は土壌に広範囲の分布を示し，僅かの湿気，栄養条件下でも発育，生存が可能で土壌，病変米，他の多くの試料より分離さる。

7. *Penicillium citreo-viride* Biourge

Colonies on Czapek agar rather restrictedly spreading, attainig a diameter of 20 to 36mm in 10 to 12 days at 25°C (FigC-7); 22 to 37 mm at 30°C, seldom growing at 37°C; (growing very well on NO_2 medium), surface appearing typically velvety or velutinous (Fig M-7A) and the other strains subfloccose, floccose or funiculose textured, plane or smooth, strongly wrinkled and buckled, vegetative hyphae delicate and yellow in color, with a white or pale yellow margin, 0,2 to 1.5 mm in wide; conidial areas in color typical bluish green, dark bluish green, yellowish green, bluish gray green shades, exudate limitedly or abundantly, pale or strongly bright yellow shades; odor slight, moldy; reverse and agar in bright yellow shades, light or strongly, penicilli strictly monoverticillate (Fig M-7B), occasionally showing prolongation of the main axis, or with 1 or 2 branches from lower nodes producing secondary verticls of sterigmata; conidiophores arising from substratum, occasionally or sometimes from trailing and branching hyphae, mostly 30 to 60 or 90μ in length by 1 2 to 3 0μ in diameter, wtih apices 2 3 to 3 8μ in diameter, smooth or nearly so walled, sterigmata compact clusters of 4 to 12, mostly 6 8 to 9 4μ by 1 2 to 2 5μ, acute type, conidia globose to subglobose, mostly 1 2 to 2 2 or larger 3 0μ in diameter, smooth or nearly walls, and the slightly walls (spines less than 0 1μ) are shown by electron microscopy (Fig E-7), conidial chains loosely parallel or column, mostly up to 30 to 100μ in length.

Colonies on steep agar somewhat larger than on Czapek, about 26 to 45 mm, in 10 to 12 days at 25°C, 24 to 41 mm at 30 C, seldom growing at 37°C, the other charaters as on Czapek.

Strains of this speceis occurs from soils and disease rice or other materials And the species widely distributed in nature It is apparently able to grow under conditions of limited moisture and nutrients that would exclude many faster growing species

(Penicillium toxicarium Miyake duplicate almost exactly as given above)

*Biourge, PH, Monograph, La Cellule 33, fasc 1 p 229, Col PL IX and Pl XV, fig 88 1923

**Thom, C, The Penicillia, pp 199 200 1930

***Raper, K B, Thom C and Fennell, D I, A Manual of the Penicillia PP 215 218 1949

****Miyake, I, Naito H and Tsunoda, H, Report of Rice Utilization Lab Japan No 1 1940

*****Abe, S, J Gen Appl Microbiology 57 58 1956.

8. *Penicillium vinaceum* Gilman and Abbott

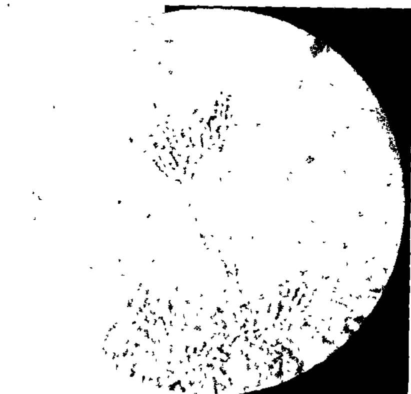


Fig. M-8. *Penicillium vinaceum* Gilman and Abbott, FAT 1291, detail of penicilli

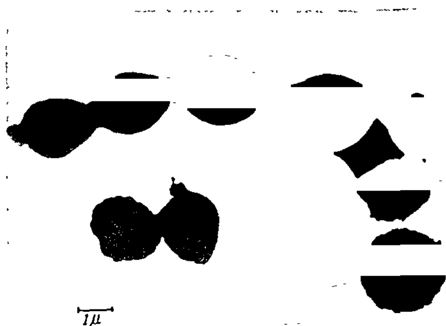


Fig. E-8 *Penicillium vinaceum* Gilman and Abbott, FAT 1291, conidia showing the smooth or nearly so walls and the ovate to subglobose form

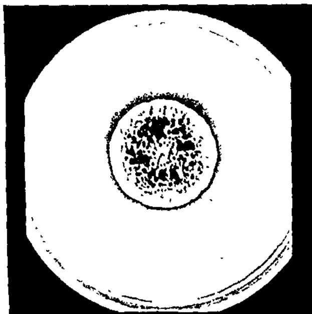


Fig. C-8A *Penicillium vinaceum* Gilman and Abbott, FAT 1291 on Czapek agar, 10 days

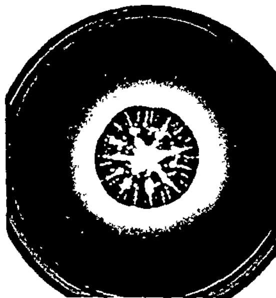


Fig C-8B *Penicillium vinaceum* Gilman and Abbott, FAT 1291, on steep agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C にて 5 日目約 18 mm，10 日目約 33 mm (Fig C-8 A), 20 日目約 50 mm.；30°C, 10日目約 40 mm ，37°C, 発育不能, 集落表面は著しい放射状の皺があり, 厚み, 10～12 mm, 集落円周部は急激に高くなっている, 又その巾は約 20 mm ；菌叢は絨状或は綿毛状，分生胞子着生は少なく，淡灰緑色；滲出物は豊富，屢々大型の水滴，淡又は濃い桃紫色 (本菌の特性), 集落裏面は桃紫色又は桃紫褐色, 集落周辺寒天は同一様色調呈色, 分生胞子柄は殆んど気菌糸より生育し, 短く, 20～60 μ×1.2～1.9 μ, 頂端は 21～31 μ, 滑面, 殆んど分岐せず, 時々散開型の分岐を作る，ペニシラスは単輪生状 (Fig M-8)，梗子 3～7 ヵ幾分か散開型に群生, 60～87 μ×14～25 μ，先端細い，分生胞子卵形又は亜球形, 端が時々尖っている, 21～28 μ, 屢々 30 μ, 滑面, 又電子顕微鏡写真 (Fig E-8) にても滑面, 分生胞子連鎖, 縺状, 長さ 30～90 μ

スティープ寒天培養にては 25°C の集落の発育は 5 日目約 20mm，10 日目約 34mm (Fig C-8B) 20 日目約54mm.，30°C10日目約 27 mm ，37°C, 発育不能；集落裏面及び滲出物はツァペック寒天培養より一層濃い呈色 他の諸特性は同上。

亜硝酸寒天培養に於ては幾分か発育。

本菌種は土壌より分離さる。

8. *Penicillium vinaceum* Gilman and Abbott

Colonies on Czapek agar growing rather

60 to 87 μ by 14 to 25 μ with apices narrowed, [illegible]

walls are shown by electron microscopy (Fig E-8), conidial chains tangled, up to 30 to 90 μ in length

Colonies on steep agar about 34 mm in 10 to 12 days at 25 C (Fig C-8B), 27 mm at 30 C, seldom growing at 37 C, essentially as above generally showing more vinaceous purple or darker in reverse and exudate, conidial structures as described above

Strains of this species occurs from soils

*Gilman, J C and Abbott, E V Iowa State College Jour Sci 1 299 fig 34 1927

**Thom, C The Penicillia pp 195 196, fig 23 1930

***Raper, K B, Thom, C and Fennell, D I, A Manual



Fig. M-9. *Penicillium multicolor* G.-M. and P., FAT 1051, detail of penicilli

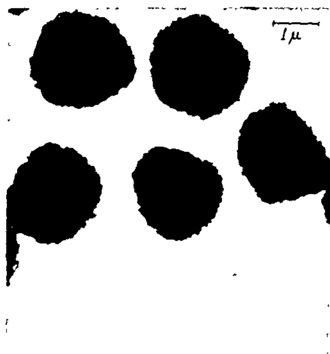


Fig. E-9. *Penic* r G. M 51,
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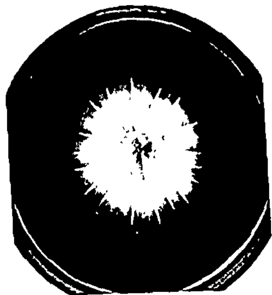


Fig C-9 *Penicillium multicolor* G-M and P, FAT 1051 on Czapek agar, 10 days

ツァペック氏寒天培養に於ける発育は25 Cにて5日目，14～18 mm，10日目 23～45 mm (Fig C-9)，20日目 46～70 mm，30°C，10日目，24～45 mm；37°C 発育不能，集落表面は放射状の皺があり，集落円周部は黄或は橙色の呈色，約10～20 mm巾（本菌の特性），菌叢ビロード状又は類似，或る菌株にては中心部に分生胞子が先づ着生し順次集落円周に向って着生して行く（併し，ビロード状）；分生胞子着生部は全面的か又は中心部から亜中心部（中位部）に局部的に着生，濃青緑色，黒緑色，濃青灰緑色，滲出物は缺，或は僅小，黄又は淡橙，褐色，集落裏面は鮮黄色或は橙，褐，褐赤色，集落周辺部は 10～20 mm巾 黄又は淡褐色，ペニシラスは単輪生状（Fig M-9），分生胞子柄は殆んど基質より直立し，又時として気菌糸より生育す，分岐せず，40～190 μ×2.0～3.7 μ，頂端膨大，3.7～7.5 μ，滑面，乾燥検鏡 (dry mounting) にて時々横壁に橙色の結晶様塊が見らる，梗子6～14ヵ幾分か並行状或は緻密に群生，8.1～10.6 μ 或は 17.5 μ×2.1～3.5 μ，分生胞子連鎖は幾分か並行状，又は円柱状，長さ，60～190 μ，分生胞子，球形，卵形又は亜球形，1.8～3.1 或は 3.7 μ，滑面，又電子顕微鏡写真 (Fig E-9) にては突起 0.1 μ 以下の僅小の粗面。

スティプ氏寒天培養にての集落の発育は25°Cにて5日目 17～26 mm，10日目，33～48 mm，20日目 58～73 mm，30 C，10日目 38～55 mm；37 C 発育不能 他の諸特性は同上。

亜硝酸ソーダ寒天培養にては発育不能，

本菌種は土壌及び腐敗物より数多く分離さる。

9. *Penicillium multicolor* Gregorieva-Manoilva and Poradielova.

Colonies on Czapek agar rather restrictedly, about 23 to 45 mm in 10 to 12 days at 25°C (Fig C-9); 24 to 25 mm at 30°C, seldom growing at 37°C; (growing little or not on NO_2 medium, especially); radially furrowed, texture velvety or velutinous, with yellow or orange margin about 1.0 to 2.0 mm in wide (some strain conidial areas usually appears at first in the center and gradually extends towards the broad margin with abundant orange-red mycelia), conidial areas developing in localized central to sub-central patches against a background of yellow to orange or orang red vegetative mycelium in some strains, in others heavily sporing throughout with the massed conidial structures characterizing the colony, in blue-green shades near Dark Bluish Gray Green, Dark Russian Green, Dull Blackish Green; exudate lacking or limitedly, yellow or pale orange, brown shades; odor not ponounced, suggesting mush-rooms; reverse in bright yellow or orange shades near Orange Rufous Chestn[illegible] (Fig. M-9), conidiophores arising from the substratum, but sometimes from aerial hyphae, usually unbranched, varying in length 40 to 190 μ by 2.0 to 3.7 μ, with apices enlarged up to 3.7 to 7.5 μ in diameter, smooth or nearly so walled, walls sometimes studded with orange colored crystals when view dry, sterigmata usually 6 to 14 in the verticil, loosely parallel or compact, mostly 8.1 to 10.6 or 17.5 μ by 2.1 to 3.5 μ, acute type, bearing chains up to 60 to 190 μ in length, loosely parallel or columns; conidia globose to ovate or subglobose, about 1.8 to 3.1 or 3.7 μ in diameter with walls appearing smooth or nearly so, and the slightly rough walls (spines less than 0.1 μ) are shown by electron microscopy (Fig E-9)

Colonies on steep agar growing more rapidly than on Czapek, up to 33 to 48 mm in 10 to 12 days at 25 C; 38 to 55 mm at 30°C; seldom growing at 37°C, the other characters as on Czapek.

Strains of this species occurs soils and other deteriorating materials.

* Grigorieva Manoilova, O C and Poradielova, N. N., Archives des Sciences Biologiques, Leningrad 19, 117-131, fig 1 and one plate with photograph 1-6 1915

** Thom, C, The Penicillia pp 212 213. 1930.

*** Raper, K B, Thom, C and Fennell, D I, A Manual of the Penicillia pp 198 201 1949

**** Abe, S, J Gen. Appl Microbiology pp 59-60 1956.

10. *Penicillium trzebinskii* Zaleski.

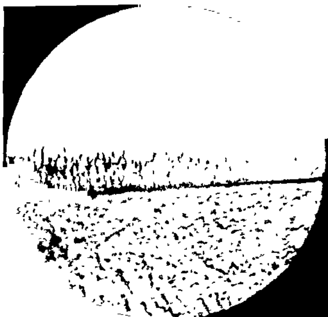


Fig. M-10 A. *Penicillium trzebinskii* Zaleki, FAT 631, low power view of colony section showing typically velvety character of texture.

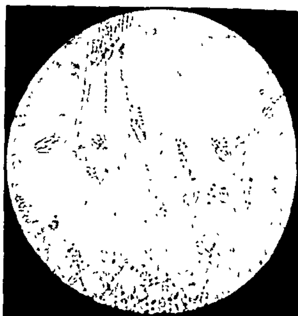


Fig. M-10 B. *Penicillium trzebinskii* Zaleski, FAT 631, detail of penicilli

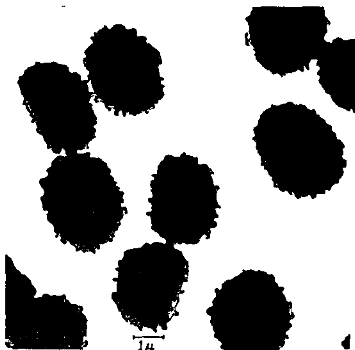


Fig. E-10 *Penicillium trzebinskii* Zaleski, FAT 631, conidia showing the echinulate or verruculose walls and the elliptical or ovate to subglobose form

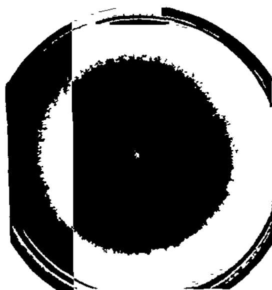


Fig C-10. *Penicillium trzebinskii* Zaleski, FAT 631 on Czapek agar, 10 days

ツァペック寒天培養に於ては集落の発育は25°Cにて5日目14~18 mm；10日目53~70 mm（Fig C-10）20日目，約80 mm；30°C，10日目14~55 mm；37°C，発育不能．菌叢ビロード状（Fig M 10 A）又は類似，集落表面，平滑又は放射状皺，集落周縁部は約1 5 mm；白色；分生胞子着生部は灰緑色又は濃青緑色．滲出物は欠又は僅小，淡褐色，集落裏面速やかにくすんだ紫色又は暗褐色，集落周辺寒天は同色調又は淡黄色，ペニシラスは単輪生状（Fig M 10 B），分生胞子柄は基質より直立，又は時として気菌糸より生出，120~430 μ×2 8~3 9 μ 又は4 1 μ，分枝せず，斑点状或は小顆粒状粗面，頂端膨大，4 3~6 5 μ；梗子5~12 カ並行又は緩束状に群生，8 7~10 6 μ 或は14 3 μ×2 5~3 3 μ，分生胞子楕円，卵形又は亜球形，2 9~3 7 μ×2 3~3 1 μ，大刺状突起粗面，又電子顕微鏡写真（Fig E-10）にても同様粗面．分生胞子連鎖並行状又は幾分か円柱状，長さ30~80 μ．

スティープ寒天培養における集落の発育は25°C 5日目28~30 mm，10日目70~74 mm，20日目82~85 mm，30°C，10日目20~70 mm，37°C，発育不能，集落裏面呈色はツァペック寒天培養よりも幾分か遅い，他の諸特性は同じ．

亜硝酸塩寒天培養にては良好なる発育を示す．本菌種は各種土壌，特に森林土壌より数多く分離さる．

10 *Penicillium trzebinskii* Zaleski.

Colonies on Czapek agar rather broadly spreading, attaining a diameter of 53 to 70 mm. in 10 to 12 days at 25°C (Fig C-10), 14 to 55 mm at 30°C; seldom growing at 37°C, (growing very well on NO_2-medium); velvety or velutionous (Fig 10A), smooth or radial furrowed, gray green or dark bluish green shades near Russian Green, with a white margin about 1 5 mm in wide; exudate lacking or limitedly, pale brown shades; ordor lacking or indefinite, reverse quickly developing deep dull violet to dark fuscous shades, with surrounding agar similar or pale yellow shades, penicilli strictly monoverticillate (Fig M 10 B), conidiophores arising from substratum, sometimes from aerial mycelium, variable in length up to 120 to 430 μ by 2 8 to 3 9 or 4 1 μ, mostly unbranched, with walls punctate or small granular, with apices enlarged up to 4 3 to 6 5 μ in diameter; sterigmata in verticils of 5 to 12, about 8 7 to 10 6 or 14 3 μ by 2 5 to 3 3 μ, parallel or compact, acute type, conidia elliptical or ovate to subglobose, mostly 2 9 to 3 7 μ by 2 3 to 3 1 μ, with walls echinulate, and the echinulate or verruculose walls are shown by electron microscopy (Fig E-10), conidial chains parallel or loosely column up to 30 to 80 μ in length

Colonies on steep agar growing broadly than Czapek, about 70 to 74 mm in 10 to 12 days at 25 C, 20 to 70 mm at 30 C, seldom growing at 37°C; reverse as on Czapek but developing dark shades less rapidly, the others characters as on Czapek

Strains of this species occurs from soils and forest

*Zaleski K, Bul Acad Polonaise Sci Math. et Nat Ser B, pp 501 502, Taf 59 1927
**Thom, C, The Penicillia, pp 203 204 1930
***Raper K B, Thom C and Fennell D I A Manual of the Penicillia, pp 231 211 1949
****Abe S J Gen Appl Microbiology pp 60 61 [illegible]

11. *Penicillium trzebinskianum* Abe



Fig. M-11 A. *Penicillium trzebinskianum* Abe, FAT 1138, low power view of colony section showing velutinous character of texture

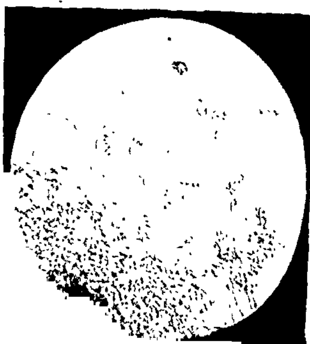


Fig. M-11 B. *Penicillium trzebinskianum* Abe, FAT 1138, detail of penicillus

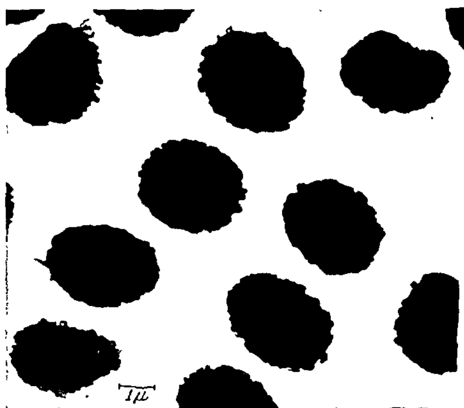


Fig. E-11 *Penicillium trzebinskianum* Abe, FAT 1138, conidia showing the echinulate or verruculose walls and the elliptical to ovate or subglobose form



Fig. C-11. *Penicillium trzebinskianum* Abe, FAT 1138, on Czapek agar, 10 days

ツァペック寒天培養における集落の発育は 25°C にて5日目 17〜20mm；10日目 42〜48mm (Fig C-11), 20日目 60〜70 mm；30°C 10日目. 46〜55 mm, 37°C, 発育不能，菌叢ビロード状 (Fig. M-11 A) 或は僅か綿毛状，集落表面は平滑又は幾分か放射状の皺があり，周辺部約 10〜12 mm 巾，白色，分生胞子着生多く，濃青緑色，中心部暗黒緑色；滲出物欠；臭，バニラ様；集落裏面は黄緑或は桃褐色，次第にオリーブ黒色，集落周辺寒天，黄色，分生胞子柄一般に基質又は基菌糸より直立，時として気菌糸から生育，60〜280 μ×25〜40 μ，頂端膨大 37〜69 又は 7.5 μ，斑点状或は小顆粒状突起粗面，時々隔壁あり；ペニシラスは単輪生状 (Fig M-11B)，梗子 5〜12 カ輪点に群生，87〜125 μ×21〜32 μ，先端，時に細い；分生胞子楕円又は卵形或は時々亜球形，25〜38 μ×23〜31 μ，大刺状突起粗面，又電子顕微鏡写真 (Fig E-11) にても同一様粗面，分生胞子連鎖，並行状又は幾分か円柱状，長さ，30〜190 μ.

スティープ寒天培養における集落の発育は 25°C にて5日目 18〜23 mm，10日目 43〜45 mm，20日目，65〜73 mm；30°C 10日目 46〜47 mm；37°C 発育不能，著しい放射状皺があり，集落裏面は褐色，褐黒色，他の諸特性は同上，亜硝酸カリ培養にてはやや良好なる発育を示す。

本菌種は土壌より分離される。

11. *Penicillium trzebinskianum* Abe

Colonies on Czapek agar rather rapidly, attaining a diameter of 42 to 48 mm in 10 to 12 days at 25°C (Fig C-11), 46 to 55 mm. at 30°C; seldom growing at 37°C; (growing and slightly sporulating on NO_2-medium); appearing velutinous (Fig M-11A) or subfloccose, consisting of some what compact basal felt, with a white margin 1.0 to 1.2 mm. wide, smooth or loosely radially furrowed, sporulating abundantly in darkish blue-green shades near Dusky Dull Green and in some, Dull Blackish Green in central areas; exudate lacking; odor definitely vanilla-like; reverse in yellowish green or vinaceous shades becoming olivaceous black, with surrounding agar in yellowish shades, conidiophores generally arising in a close stand directly from the substratum or basal felt, sometimes from aerial mycelium, M 11B); sterigmata in verticils of 5 to 12, compact mostly 8.7 to 12.5 μ by 2.1 to 3.2 μ type, with conidium bearing tips sometimes narrowed; conidia elliptical to ovate or sometimes subglobose, mostly 2.5 to 3.8 μ by 2.3 to 3.1 μ with walls echinulate, and the echinulate or verruculose walls are shown by electron microscopy (Fig. E-11); chains of conidia in parallel or loose columns up to 30 to 190 μ in length

Colonies on steep agar spreading, up to 43 to 51 mm. in 10 to 12 days at 25 C, 46 to 47 mm at 30 C, seldom growing at 37 C; strongly radially furrowed, reverse near Umber shades becoming blackish brown, others characters as described above

Strains of this species occurs from soils

*Abe,S J Gen Appl Microbiology 63 64 1956



Fig. M-11 A. *Penicillium trzebinskianum* Abe, FAT 1138, low power view of colony section showing velutinous character of texture

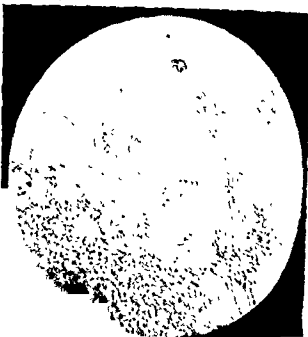


Fig. M-11 B. *Penicillium trzebinskianum* Abe, FAT 1138, detail of penicillus.

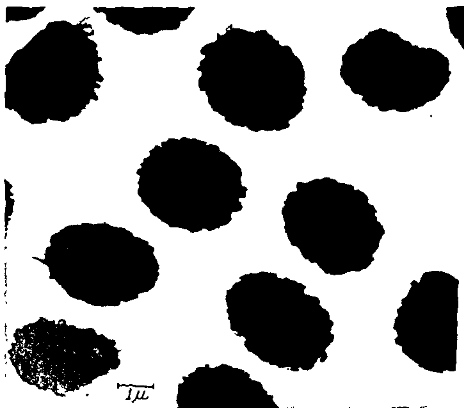


Fig. F-11. *Penicillium trzebinskianum* Abe, FAT 1139, conidia showing the echinulate or verruculose walls and the elliptical to ovate or subglobose form



Fig. C-11. *Penicillium trzebinskianum* Abe, FAT 1138, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C にて5日目 17～20mm; 10 日目 42～48mm. (Fig. C-11), 20 日目 60～70 mm; 30°C 10日目 46～55 mm; 37°C, 発育不能，菌叢ビロード状 (Fig M-11 A) 或は僅か綿毛状，集落表面は平滑又は幾分か放射状の皺があり，周辺部約 10～12 mm 巾，白色，分生胞子着生多く，濃青緑色，中心部暗甲緑色；滲出物欠；臭，バニラ様，集落裏面は黄緑或は桃褐色，次第にオリーブ黒色，集落周辺寒天，黄色；分生胞子柄一般に基質又は基菌糸より直立，時として気菌糸から生育，60～280 μ×25～40 μ，頂端膨大 37～69 又は 75 μ，斑点状或は小顆粒状突起粗面，時々隔壁あり；ペニシリは単輪生状 (Fig M-11B)；梗子 5～12 ヵ輪生に群生，87～125 μ×21～32 μ，先端，時に細い；分生胞子楕円又は卵形或は時々亜球形，25～38 μ×23～31 μ，大刺状突起粗面，又電子顕微鏡写真 (Fig E-11) にても同一様粗面；分生胞子連鎖，並行状又は幾分か円柱状，長さ，30～190 μ

スティープ寒天培養に於ける集落の発育は 25 C にて 5 日目 18～23 mm; 10 日目 43～45 mm，20 日目，65～73 mm，30°C 10 日目 46～47 mm，37°C 発育不能，著しい放射状皺があり，集落裏面は褐色，褐黒色，他の諸特性は同上。亜硝酸寒天培養にてはやや良好なる発育を示す。

本菌株は土壌より分離さる。

11. *Penicillium trzebinskianum* Abe.

Colonies on Czapek agar rather rapidly, attaining a diameter of 42 to 48 mm in 10 to 12 days at 25°C (Fig C-11); 46 to 55 mm at 30°C, seldom growing at 37°C, (growing and slightly sporulating on NO_2-medium); appearing velutinous (Fig M-11A) or subfloccose, consisting of some what compact basal felt, with a white margin 1 0 to 1.2 mm wide, smooth or loosely radially furrowed, sporulating abundantly in darkish blue-green shades near Dusky Dull Green and in some, Dull Blackish Green in central areas, exudate lacking; odor definitely vanilla-like, reverse in yellowish green or vinaceous shades becoming olivaceous black, with surrounding agar in yellowish shades, conidiophores generally arising in a close stand directly from the substratum or basal felt, sometimes from aerial mycelium, mostly 60 to 280 μ long by 2 5 to 4 0 μ in diameter, with apices, up to 3 7 to 6 9 or 7.5 μ in diameter, with walls punctate or small granular, sometimes septated, penicilli strictly monoverticillate (Fig M-11B), sterigmata in verticils of 5 to 12, com pact mostly 8 7 to 12 5 μ by 2 1 to 3 2 μ type, with conidium bearing tips sometimes narrowed, conidia elliptical to ovate or sometimes subglobose, mostly 2 5 to 3 8 μ by 2 3 to 3 1 μ with walls echinulate, and the echinulate or verruculose walls are shown by electron microscopy (Fig E 11), chains of conidia in parallel or loose columns up to 30 to 190 μ in length.

Colonies on steep agar spreading, up to 43 to 54 mm in 10 to 12 days at 25 C, 46 to 47 mm at 30°C, seldom growing at 37 C, strongly radially furrowed, reverse near Umber shades becoming blackish brown, others characters as described above *

Strains of this species occurs from soils

*Abe, S J Gen Appl Microbiology 63-64 1956

12. *Penicillium lividum* Westling.

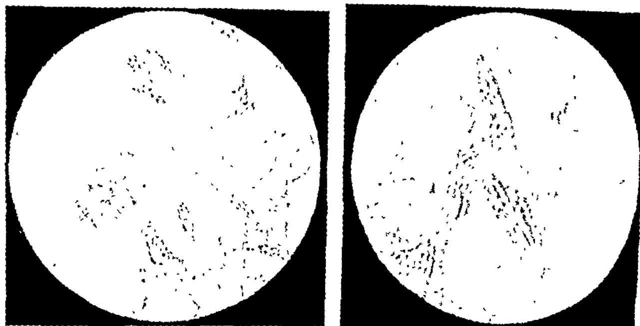


Fig. M-12 A, B. *Penicillium lividum* Westling, FAT 626, detail of penicilli



Fig. E-12. *Penicillium lividum* Westling, FAT 877, conidia showing the slig rough walls and the definitely elli , ovate form

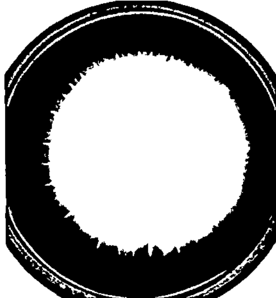


Fig. C-12. *Penicillium lividum* Westling, FAT 877, on Steep agar, 10 days

12. *Penicillium lividum* Westling

Colonies on Czapek agar growing rather rapidly or broadly, attaining a diameter of 51 to 70 mm in 10 to 12 days at 25°C, 40 to 45 mm at 30°C, seldom growing at 37°C; (growing very well on NO_2-medium), loosely velutinous, about 1 mm. or 1.3 mm in central area deep, radial furrowed, with a white margin about 3 to 5 mm in wide, in blue-green or yellow green shades near Civette Green, American Green to Deep Olive to dark olive gray; exudate lacking; odor wanting or indefinite, reverse at first colorless becoming dull *peach or flesh shades near Light Ochraceous Buff*, with surrounding agar colorless, penicilli strictly monoverticillate (Fig M-12); conidiophores mostly single and arising from the substratum separately unbranched, long, up to 170 to 400 or 640 μ by 2 1 to 3 4 μ, sometimes septate, smooth or nearly so walled, with apices some what enlarged up to 3 1 to 5 0 μ in diameter, sterigmata mostly 5 to 10 in the verticil, parallel or loosely, 8 1 to 12 5 μ occasionally 15 0 μ by 2 1 to 3 0 μ; conidia definitely elliptical or ovate, fusiform, mostly 3 1 to 4 4 μ by 2 3 to 3 1 μ, with walls smooth or nearly so, and the slightly rough (spines less than 0 1 μ) walls are shown by electron microscopy (Fig E-12); conidial chains tangled or loosely columns, up to 60 to 160 μ in length

Colonies on steep agar growing more rapidly, up to 72 to 76 mm in 10 to 12 days at 25 C (Fig C 12), 43 to 60 mm at 30 C, seldom growing at 37 C, the others characters as described above

Strains of this species occurs from soils

* Westling, R, Arkiv for Botanik II 58 131 137, 1911, Dale Ann Mycol 12 52 1914

** Thom, C The Penicillia, pp 205 206 1930

*** Raper, K B Thom, C and Fennell, D I, A Manual of the Penicillia pp 190 192 1949

****Abe, S, J Gen Appl Microbiology p 65 1956.

ツァペック寒天培養に於ける集落の発育は 25°C にて5日目 32~37 mm, 10日目, 51~70 mm, 20日目 69~72 mm, 30°C, 10日目, 40~45 mm, 37°C, 発育不能；菌叢ビロード状様，集落の厚さは中心部で 1~1 3 mm，放射状の皺があり，集落円周部は約 3~5 mm 巾の白色；分生胞子着色部は青緑或は黄緑色，順次オリーブ色又は暗オリーブ灰色を呈す；滲出物は欠，集落裏面は無色，順次 桃又はくすんだ桃褐色を呈す，集落周辺寒天は無色，ペニシラスは単輪生状 (Fig M 12)；分生胞子柄は多くは単立で基質より直立し，分枝せず，170~400 又は 640μ×2 1~3 4μ，時に横壁を有し，滑面，頂端幾分か膨大，3 1~5 0μ，梗子並行状又は傾斜状に 5~10 ヵ群生，8 1~12 5μ 屢々 15 0μ×2 1~3 5μ，分生胞子楕円又は卵形，紡錘状，3 1~4 4μ×2 3~3 1μ，滑面，又は電子顕微鏡写真 (Fig E-12) にては0 1μ 以下の僅小粗面，分生胞子連鎖は縺状又は幾分か円柱状，長さ 60~160μ

スティープ寒天培養にては25 Cにて5日目 36~40 mm, 10日目 72~76 mm, (Fig C-12), 20日目, 75~78mm, 30 C 10日目 43~60 mm, 37 C 発育不能，他の諸特性は同上。

亜硝酸寒天培養にては良好なる発育を示す

本菌種は土壌より得らる。

14. *Penicillium implicatum* Biourge

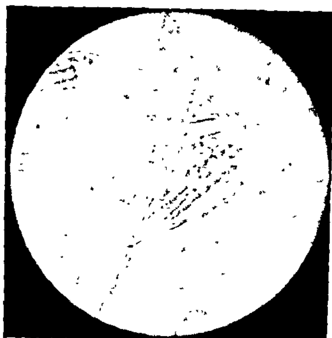


Fig. M-14A. *Penicillium implicatum* Biourge, FAT 137, detail of single penicillus



Fig. M-14B. *Penicillium implicatum* Biourge, FAT 825, penicilli as developed at colony margin

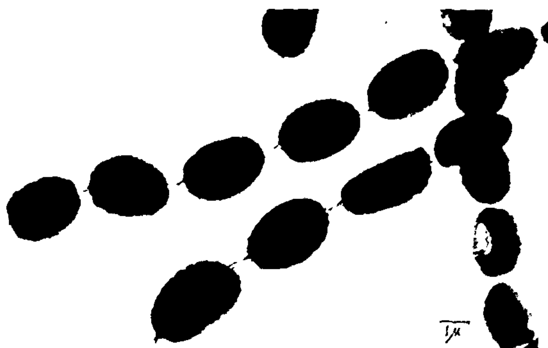


Fig. E-14. *Penicillium implicatum* Biourge FAT 1215, conidia showing the slightly rough walls and the elliptical to ovate form

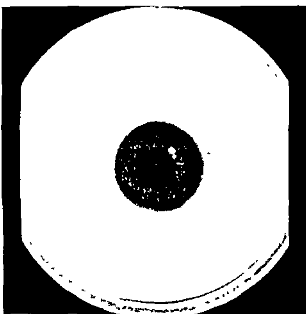


Fig. C-14. *Penicillium implicatum* Biourge, FAT 1299, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C にて 5 日目 12~20 mm, 10 日目 31~48 mm (Fig C-14) 20 日目, 52~72 mm; 30°C, 10 日目 30~50 mm; 37°C, 発育不能, 菌叢はビロード状或は類似状 集落円周部は約 10~20 mm 巾, 白色, 分生胞子の着生多く, 幾分か壊れ易い傾向を有し, 中心部はもり上っている。分生胞子着生部は濃い青緑或は黄緑色, 又は濃青灰, 滲出物は欠又は僅小, 小水滴で, 無色, 又は黄, 赤褐色; 集落裏面及び周辺寒天は, 黄, 橙, 暗赤褐色, 赤色又は屡々紫又は菫色, ペニシラスは単輪生状 (Fig M 14A), 分生胞子柄短く, 殆ど基質より直立又は時々匍匐菌糸より生育, 多くは 30~120 μ 又は 190 μ×1 8~2 8 μ 又は 3 5 μ, 滑面, 頂端は幾分か膨大, 3 5~6 8 μ 或は 9 4 μ, 梗子は緻密或は幾分か散開型に 6~12 或は 14 ケ群生し, 9 3~11 9 μ 或は 16 2 μ ×2 0~3 0 μ 或は 3 7 μ, 分生胞子は楕円又は卵形, 亜球形 2 3~3 2 μ×1 8~2 5 μ 又は時々大型の 4 7 μ×3 7 μ, 滑面, 又電子顕微鏡写真 (Fig E 14) にては 0 1 μ 以下の僅小粗面, 分生胞子連鎖は円柱状或は並行状又は類似形, 長さ 30~120 μ 或は 340 μ (Fig 14 B)。

ステイープ寒天培養に於ける集落は 25°C にて 5 日目 14~21 mm, 10 日目 33~51 mm, 20 日目 56~75 mm, 30°C, 10 日目 30~50 mm, 37°C 発育不能, 他の諸特性は同上

亜硝酸加入培地にては発育不能

本菌種は土壌, タバコ或は腐敗物等より数多く分離される

14 *Penicillium implicatum* Biourge

Colonies on Czapek agar growing rather restrictedly, about 31 to 48 mm in 10 to 12 days at 25°C (Fig C-14); 30 to 50 mm at 30°C; seldom growing at 37°C; (growing little or not on NO_2-medium); velvety or velutionous, with growing white margin, narrow, about 1 0 to 2 0 mm in wide, very heavy sporing, umbonate, piled in center, showing some tendency to form crusts of conidia in age, bluish green or Yellow green, bluish gray green shades near Dark Russian Green, Dark American Green, Bluish Gray Green, to *Dull Balckish Green* or *Andover Green*, exudate lacking or limited, in small drops colorless, yellowish or in red brown shades; odor indistinct, weak or lacking, reverse and agar yellow to orange to deep red-brown or maroon or occasionally purplish or violet shades, penicilli usually monoverticillate (Fig M-14A), conidiophores short arising usually from the substratum in a dense stand or sometimes from trailing hyphae, mostly 30 to 120 or 190 μ by 1 8 to 2 8 or 3.5 μ, with walls smooth or nearly so, apices somewhat enlarged 3 5 to 6 8 or 9 4 μ in diameter; sterigmata compact or somewhat divergent, mostly 6 to 12 or 14 in the verticil, ranging from 9 3 to 11 9 or rarely 16 2 μ by 2 0 to 3 0 or 3 7 μ; conidia elliptical or ovate, subglobose, 2 3 to 3 2 μ by 1 8 to 2 5 μ and sometimes larger 4 7 μ by 3 7 μ, with walls smooth or nearly so, and the slightly rough walls are shown by electron microscopy (Fig E 14), conidial chains column or parallel or loosely (Fig 14-B), up to 30 to 120 μ or 340 μ in length

Colonies on steep agar growing up to 33 to 51 mm in 10 to 12 days at 25°C, 30 to 50 mm at 30°C, seldom growing at 37°C, the others characters as on Czapek

Strain of this species occurs from soils and Tobacco and other deteriorating materials

*Biourge, PH, Monograph La Cellule 33 fasc I., pp 278 280, col Pl IX and P 1 XIV, fig 82 1923

**Thom, C, The Penicillia, pp 210 211 1930

***Raper, K B Thom, C and Fennell, D I, A Manual of the Penicillia, pp 201-203 1649

****Abe, S, J Gen Appl Microbiology p 67 1956

15. *Penicillium adametzioides* Abe

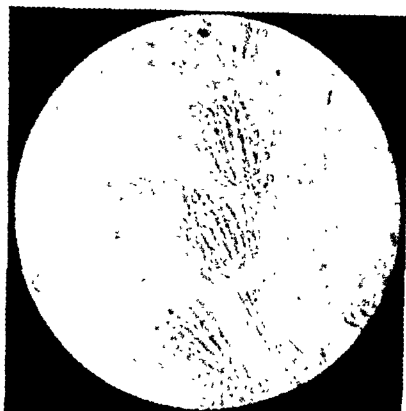


Fig. M-15. *Penicillium adametzioides* Abe, FAT 1302, detail of penicilli

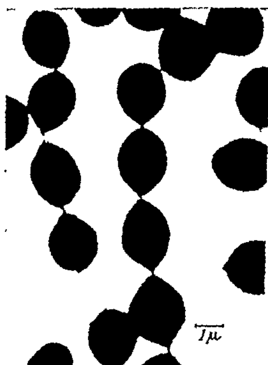


Fig. E-15. *Penicillium adametzioides* Abe, FAT 1302 conidia showing the smooth or nearly so walls

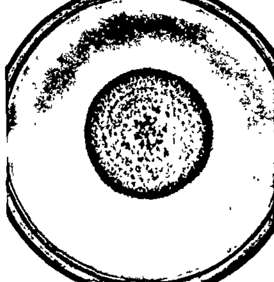


Fig C-15 *Penicillium adametzioides* Abe, FAT 1302, on Czapak agar, 10 days

ツァペック寒天培養に於ける集落の発育は25°Cに於て5日目約10~14 mm, 10日目, 33~39 mm (Fig C-15) 20日目, 58~60 mm, 30°C, 10日目33~39 mm; 37°C, 発育不能, 菌叢ビロード状, 或る菌株では綱状; 集落周囲部1 0~1 5 mm巾, 白色, 薄い, 或は幾分か綱状; 平滑又は時々放射状の皺を形成, 集落厚みは中心部500~800 μ; 分生胞子着生部は薄黄緑, 又はくすんだ黄緑色, 滲出物は僅少或は豊富, 黄又は黄褐色, 集落裏面は橙色或は橙褐色, 順次赤褐色, 桃紫, 桃紫色, 集落周辺寒天は著しい呈色, 桃褐色, 黄赤褐色, 分生胞子柄は一般的に基質, 時として気菌糸より生育, 30~120 μ×1 8~3 1 μ, 頂端は膨大し, 3 1~6 2 μ, 滑面, ペニシラスは単輪生状 (Fig M 15), 梗子は稠密又は幾分か散開形に6~10ケ群生, 8 7~10 6 μ或は15 6 μ×1 8~2 5 μ, 滑面, 分生胞子楕円又は亜球形, 2 3~3 3 μ×1 5~2 5 μ, 滑面, 電子顕微鏡写真 (Fig E-15) にても同一, 分生胞子連鎖は縺状, 長さ30~90 μ

スティープ寒天培養に於ける集落の発育は25°Cにて5日目14~18 mm, 10日目, 37~39 mm, 20日目64~68 mm, 30 C, 10日目38~39 mm, 37°C発育不能, 分生胞子着生多く, 黄緑色, 集落裏面褐赤色, 集落周辺寒天赤褐色, 他の諸特性は同上.

本菌種は土壌より分離さる.

15 *Penicillium adametzioides* Abe

Colonies on Czapek agar are rather rapidly spreading, 33 to 39 mm in 10 to 12 days at 25°C (Fig C-15), 33 to 39 mm at 30°C; seldom growing at 37°C, (growing little or not on NO_2-medium); typically velvety, some strain funiculose, with a white margin 1 0 to 1 5 mm wide and thin or slightly funiculose, smooth or sulcate, sometimes radially furrowed, colony depth 500 to 800 μ in the central areas; sporulating throughout in pale yellow green near Greenish Glaucous Blue in the marginal area and Pea Green in the central area, becoming Sage Green or Pea Green, exudate limited or abundant, Sulphur or Aniline Yellow, reverse in orange or orange cinnamon shades, becoming reddish brown, Pale Vinaceous or Light Vinaceous Lilac, with surrounding agar strongly pigmented in Vinaceous Tawny, becoming Xanthine Orange or Pale Green Yellow, conidiophores generally arising from the substratum, sometimes from hyphae, short, commonly 30 to 120 μ by 1 8 to 3 1 μ, with apices enlarged 3 1 to 6 2 μ in diameter, with smooth walls or nearly so, penicilli strictly monoverticillate (Fig M 15), comparatively short, sterigmata usually compact or somewhat divergent, crowded verticils, numbering about 6 to 10, mostly 8 7 to 10 6 μ or rarely 15 6 μ by 1 8 to 2 5 μ, acute type with smooth walls or nearly so, conidia elliptical to subglobose, 2 3 to 3 3 μ by 1 5 to 2 5 μ, smooth walled or nearly so in optical and electron microscopy (Fig E-15), and chains of conidia tangled, up to 30 to 90 μ in length

Colonies on steep agar rather rapidly spreading, 37 to 39 mm in 10 to 12 days at 25 C, 38 to 39 mm at 30 C, seldom growing at 37 C, heavily sporulating throughout in near Tea Green shades, reverse strongly brown-red shades, with surrounding agar in reddish brown shades, the other characters as on Czapek

Strains of this species isolated from soils

*Abe, S J Gen Appl Microbiology pp 68 69 1956



16. *Penicillium decumbens* Thom

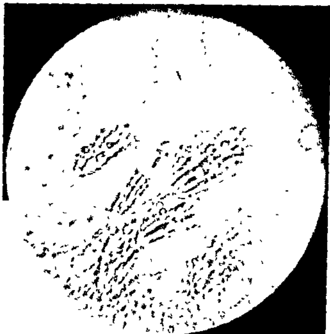
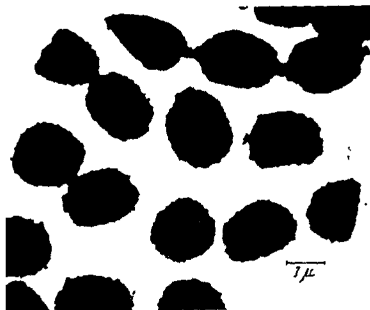


Fig. M-16A. *Penicillium decumbens* Thom, FAT 1071, detail of penicilli.



Fig. M-16B. *Penicillium decumbens* Thom, FAT 1071, detail of penicilli as developed on aerial mycelium



C-16 *Penicillium decumbens* Thom, FAT 601, conidia showing the slightly rough walls and the elliptical or ovate to fusiform form.

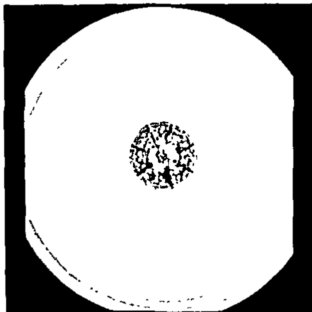


Fig C-16 *Penicillium decumbens* Thom, FAT 1071, on Czapek-agar, 10 days

ツァペック氏寒天培養に於ける集落の発育は 25 C に於て 5 日目 9〜16 mm, 10日目 18〜25 mm (Fig. C-16), 20 日目, 20〜61 mm, 30°C, 10 日目, 18〜25 mm, 37°C 発育不能, 菌叢は, 或る菌株にてはビロード状, 又菌株にて中心部に白色菌糸の二次的発育を示す傾向あり, 又他菌株にては僅小な綿毛状或は絨状, 集落表面は平滑或は放射状の皺あり, 集落周囲部は 0 3〜2 0 mm 巾, 白色, 分生胞子着生部は青緑色或は灰黄緑色, 類似同一色調又は灰オリーブ色を呈す, 滲出物は欠或は豊富, 無色; 集落裏面は無色或は一部分僅かにオリーブ色又は緑色気味呈色, 集落周辺寒天無色, ペニシラスは単輪生状 (Fig M 16) 時に分岐, 分生胞子柄, 短く, 30〜45 μ 時に120 μ×1 2〜2 2 μ 又は 3 4 μ 頂端は幾分か膨大 2 5〜4 0 μ (時々膨大 8 7 μ), 滑面, 梗子密集或は並行状に 6〜14 ヵ群生, 6 8〜9 4 μ 或は 12 5 μ×1 6〜3 2 μ, 分生胞子楕円, 卵形, 又は紡錘形, 2 1〜3 0 μ 又は 3 3 μ×1 6〜2 4 μ, 滑面, 電子顕微鏡写真 (Fig E 16) にては 0 1 μ 以下の僅小な粗面, 分生胞子連鎖は幾分か円柱状或は縺状, 長さ 30〜60 μ 又は 120 μ

スティープ氏寒天培養の集落の発育は 25 C, 5 日目にて 12〜16 mm, 10日目, 22〜28 mm, 20日目, 29〜57 mm, 30 C, 10 日目 15〜27 mm, 37 C, 発育不能 他の諸特性は同上, 亜硝酸ソーダ寒天培養にてはやや発育乃至発育良好

本菌種は諸種の土壌又は腐敗物より屢々分離さる

16. *Penicillium decumbens* Thom

Colonies on Czapek agar growing restrictedly, attaining a diameter of 18 to 25mm in 10 to 12 days at 25°C (Fig C-16), 18 to 25mm at 30°C, seldom growing at 37°C; (growing fairly well or very well on NO_2-medium), almost velvety in some strains, in others showing a tendency to develop white mycelial overgrowth in central areas, in others slightly floccose or funiculose appearance, smooth or radial furrowed, with a narrow white margin about 0 3 to 2 0 mm in wide, colored in bluish green or grayish yellow-green shades near Dark Bluish Glaucous or Vetiver Green, Pois Green, becoming to Grayish Olive, Parrot Green, or similar shades, exudate lacking or abundantly, colorless; odor distinctive fragrant, suggesting soap perfumes, reverse colorless or slightly olive or greenish shades, with surrounding agar colorless, penicilli strictly monoverticillate (Fig M-16) and sometimes showing a branch, conidiophores mostly short, up to 30 to 45μ or 120μ by 1 2 to 2 2μ or 3 4μ, with apices somewhat enlarged up to 2 5 to 4 0μ (sometimes larger 8 7μ), smooth or nearly so walled, sterigmata mostly in compact or parallel clusters up to 6 to 14 in number, 6 8 to 9 4μ or longer 12 5μ by 1 6 to 2 2 or 3 2μ, conidia elliptical or ovate, fusiform, 2 1 to 3 0μ or 3 3μ by 1 6 to 2 4μ smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-16), conidia chains loosely column or tangled, up to 30 to 60μ or 120μ in length

Colonies on steep agar growing somewhat larger than on Czapek, growing about 22 to 28 mm in 10 to 12 days at 25 C, 15 to 27 mm at 30 C, seldom growing at 37 C, the other characters as on Czapek

Strains of this species occurs from soils and deteriorating materials

*Thom, C, U S Dept Agr Bur Anim Ind, Bul 118 p 71, fig 28 1910, The Penicilla pp 197 193 1930

**Raper K B, Thom, C and Fennell, D I A Manual of the Penicillia pp 209 212 1949

***Abe, S J Gen Appl Microbiology pp 69 70 1956



17. *Penicillium capsulatum* Raper and Fennell.

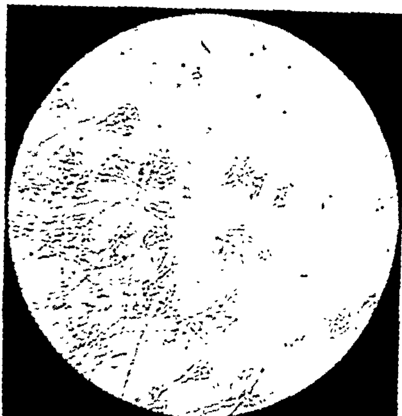


Fig. M-17. *Penicillium capsulatum* Raper and Fennell, FAT 564, detail of penicilli

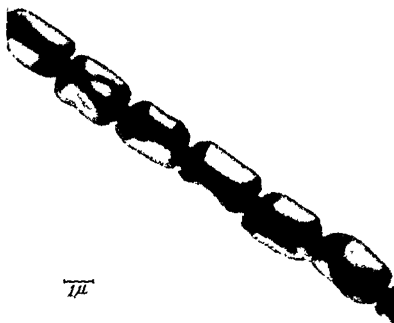


Fig. E-17. *Penicillium capsulatum* Raper and Fennell FAT 564, conidia showing the smooth or nearly so walls and the elliptical or capsule shape

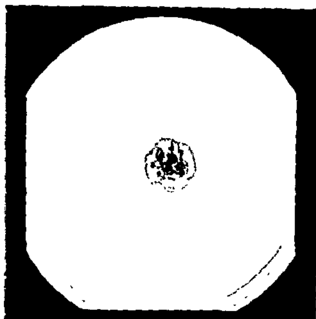


Fig. C-17. *Penicillium capsulatum* Raper and Fennell, FAT 564, on czapek agar, 10 days

ツァペック氏寒天培養における集落の発育は 25°C にて 5日目6~7mm, 10日目15~18mm (Fig C-17) 20日目, 29~30mm; 30°C, 10日目 12~18mm, 37°C 発育不能; 菌叢ビロード状或は僅かに綿毛状, 集落表面平滑又は中心部幾分か隆起, 集落円周部 0 2~0 5mm 巾, 白色, 分生胞子着生部は灰黄緑色又は灰緑色, 順次同一色調又は灰オリーブ色を呈す, 滲出物は欠或は僅少, 淡黄色; 集落裏面は黄又は褐色調, 順次, 赤色又は褐オリーブ色を呈す, 集落周辺寒天は黄又は橙色; ペニシラスは単輪生状, 各種分岐状に着生しているが, 各々単輪生状特性を示す (Fig. M 17), 分生胞子柄は基質或は匍匐又は交錯菌糸より生じ, 短く, 30~60μ×1.2~2.4μ, 頂端は膨大, 3 1~5 0μ 或は 5 6μ, 滑面; 梗子緻密又は並行状に 5~10 カ群生, 7.5~9 4μ 或は 12 5μ×1 5~2 1μ, 分生胞子は楕円, 一般的に (Capsule tube) カプセル管形, 2 6~3 2μ×1 8~2 7μ, 滑面, 又電子顕微鏡写真 (Fig E 17) にても滑面; 分生胞子連鎖は幾分か並行状又は円柱状 長さ 30~60μ

スティープ氏寒天培養における集落の発育は 25°C に 5日目約 9mm, 10日目, 17~18mm 20日目約 32mm; 30°C 10日目 17~18mm, 37°C 発育不能, 集落裏面赤色調; 他の諸特性は同上,

亜硝酸氏人培養にてはやや良好なる発育を示す,

本菌株は土壌又は腐敗物等より分離さる,

17. *Penicillium capsulatum* Raper and Fennell

Colonies on Czapek agar growing restrictedly, attaining a diameter of 15 to 18 mm in 10 to 12 days at 25°C, (Fig C-17) 12 to 18mm at 30°C, *seldom growing at 37°C, (growing and slightly sporulating on* NO_2*-medium)*, velvety or slightly floccose, smooth or raised in central area, with growing white margin narrow, about 0 2 to 0 5mm wide, in dull yellow green or gray green shades near Pistachio Green or Mytho Green, becoming similar or grayish olive; exudate lacking or limitedly, sulphur yellow, odor lacking or indefinite, reverse yellow or brownish shades, changing to red or Brownish olive, with surrounding agar yellow or orange shades; penicilli monoverticillate, borne on branches of varying length and occasionally more or less clustered but consistently retaining their individual character (Fig M-17), *conidiophores ascending, arising primarily from the* substratum or creeping, interlacing hyphae, from very short up to 30 to 60μ by 1 2 to 2 4μ, with apices larger up to 3 1 to 5 0μ or 5 6μ, smooth or nearly so walled, sterigmata compact or parallel in crowded cluster of 5 to 10, mostly 7 5 to 9 4μ or 12 5μ by 1 5 to 2 1μ conidia elliptical, commonly capsule shaped, mostly 2 6 to 3 2μ by 1 8 to 2 7μ with walls smooth or nearly so, and the smooth or nearly so walls are shown by electron microscopy (Fig E 17), conidial chains loosely parallel or column, up to 30 to 60μ in length

Colonies on steep agar growing similar on Czapek, about 17 to 18 mm in 10 to 12 days at 25 C, *17 to 18 mm at 30 C, seldom growing at 37 C*, smooth or radial furrowed, reverse typically red shades, the other characters as on Czapek

Strains of this species occurs from soils and deteriorating materials

*Raper, K B, and Fennell, D I, Mycologia 40 528 530, fig 7 1948

**Raper, K. B, Thom, C and Fennell, D I, A Manual of the Penicillia pp 242 244 1949

***Abe, S, Gen J Appl Microbiology 72 1956

18. *Penicillium velutinum* van Beyma.

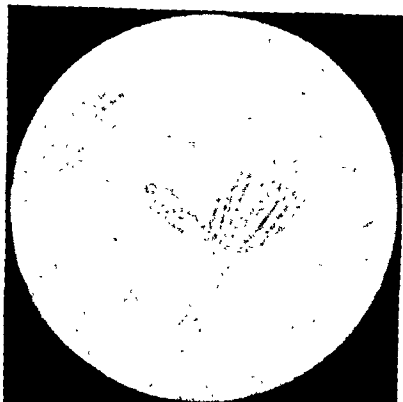
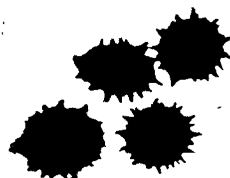


Fig. M-18. *Penicillium velutinum* van Beyma, FAT 1121, detail of penicilli



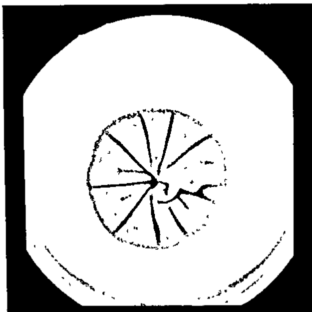


Fig. C-18 *Penicillium velutinum* van Beyma, FAT 1121, on Czapek agar, 10 days

ツァペック寒天培養における集落の発育は 25°C にて5日目 22~27 mm, 10日目 39~50 mm,（Fig C-18）20日目, 67~70 mm; 30°C, 10日目, 43~48 mm; 37°C 発育不能，集落表面は，明確に又は幾分か放射状の皺があり，分生胞子の着生は僅小或は豊富，菌叢ビロード状又は類似或は多少綿毛状，分生胞子着生部は青緑色或はくすんだオリーブ緑色，順次黒オリーブ色又は灰オリーブ色を呈す，滲出物は欠又は僅小，無色，集落裏面はくすんだ黄或は桃橙色，順次灰桃褐色又は赤褐色を呈す，集落周辺寒天は無色，分生胞子柄は基質より直立か又は気菌糸より分岐着生，50~300 μ 或は 380 μ×2 1~2 7 又は 3 4 μ，頂端幾分か膨大，2 5~4 4 μ，滑面，ペニシラスは単輪状で，（Fig M-18）で，多分岐状に着生，又は不規則な分岐を示す，分生胞子連鎖は幾分か錯状，時に幾分か並行状，長さ 60~120 μ，梗子幾分か散開状に 3~7 ヵ群生，6 2~8 0 又は 9 4 μ×1 5~2 4 又は 3 1 μ，先端部幾分か細い，分生胞子球形或は卵形又は亜球形，2 1~3 1 又は 3 4 μ，大刺状，又は疣状粗面，又電子顕微鏡写真（Fig E 18）にても同様粗面。

スティープ寒天培養の集落の発育は 25 C 5日目 25~29 mm，10日目，43~51 mm，20日目 73~77 mm，30 C 10日目 45~50 mm，37 C，発育不能，集落裏面，ツァペック寒天培養におけるよりも濃呈色，他の諸特性は同じ。

亜硝酸寒天培養にては良好なる発育を示す

本菌種は土壌又は腐敗物より分離さる。

18 *Penicillium velutinum* van Beyma

Colonies on Czapek agar fairly rapidly growing, attaining a diameter of 39 to 50 mm in 10 to 12 days at 25°C (Fig. C-18), 43 to 48 mm at 30°C, seldom growing at 37°C, (growing very well on NO_2-medium); typically or loosely radially furrowed, light to heavy sporing, almost velvety or velutinous, some strains subfloccose, in blue-green or dull olive green shades, becoming slate olive or grayish olive to deep slate olive shades, exudate lacking or limited, colorless; odor lacking or indefinte; reverse in dull yellow or vinaceous orange shades becoming grayish vinaceous or kaiser brown, with surrounding agar colorless, conidiophores commonly borne as branches from aerial hyphae, occasionally directly from the substratum, mostry 50 to 300 or 380 μ long by 2 1 to 2.7 or 3 4 μ, with apices somewhat enlarged up to 2 5 to 3 6 μ or 4 4 μ, with walls smooth or nearly so, penicilli sometimes strictly monoverticillate, usually camigenous and irregularly branched (Fig M-18), bearing conidial chains up to 60 to 120 μ in length, usually loosely tangled, sometimes loosely parallel, sterigmata usually in simple verticils numbering 3 to 7, mostly 6 2 to 8 0 or 9 4 μ by 1 5 to 2 4 or 3 1 μ, with tips somewhat pointed and usually loosely divergent, conidia globose or ovate to subglobose, about 2 1 to 3 1 or 3 4 μ, with walls echinulate or verruculose, and the echinulate or verruculose walls are shown by electron microscopy (Fig, E-18).

Colonies on steep agar sprerding broadly, 42 to 51 mm in 10 to 12 days at 25 C, 45 to 50 mm at 39 C, seldom growing at 37 C, reverse darker shades than on Czapek, the other characters as on Czapek

Strains of this species occurs from soils and deteriorating maetrials

*Van Beyma, F H, Zentbl F Bakt etc, (II) 91, 352 353, fig 6 1935

**Raper K B Thom, C and Fennell, D I, A Manual of the Penicillia, pp 250 251, 1949

**Abe S J Gen Appl. Microbiology 74 1569,

19. *Penicillium lilacinum* Thom.

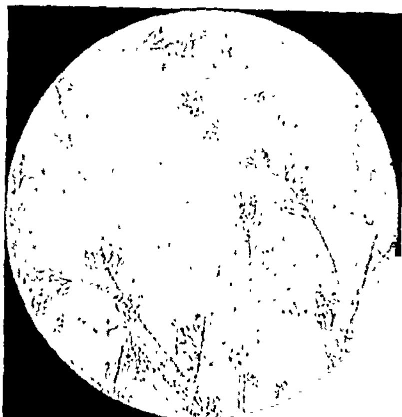


Fig. M-19. *Penicillium lilacinum* Thom, FAT 1233, detail of penicilli



Fig. E-10. *Penicillium lilacinum* Thom, FAT 1233 conidia showing the smooth or nearly so walls and the elliptical or fusiform form

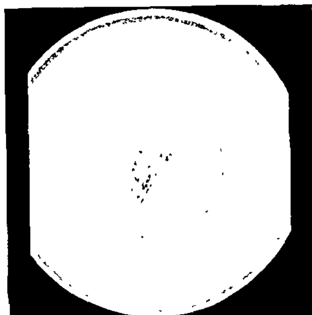


Fig. C-19. *Penicillium lilacinum* Thom, FAT 1233, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C 5日目 21~25 mm, 10日目 41~55 mm (Fig C-19), 20日目 62~75 mm; 30°C 10日目 48~55 mm, 37°C 発育不能；菌叢は綿毛状, 又は類似状, 或る菌株にては中心部が隆起, 浅く, 且放射状の皺を有し, 最初は白色, 順次分生胞子着生部は桃色, 桃紫色, 分生胞子着生度合は菌株にて異なる, 一般的に豊富, 集落円周部は白色, 0.5~1.0 mm 巾, 滲出物は欠又は僅小, 無色又は桃紫色, 集落裏面は常に桃紫, 桃紫色, 順次暗赤紫, 又は褐桃紫色, 分生胞子柄は集落円周部にては基質より直立, 又中心部にては気菌糸より生育, 30~380μ 又は以上×1.8~3.0μ 又は 4.0μ, 頂端部幾分か膨大 2.3~4.0μ, 滑面又は粗面, ペニシラスはサイズ及び形状は各種様々 (Fig M 19), 不整斉状著しい散開状分生胞子連鎖は縺状, 長さ 50~90μ, 本属通例の分岐状ではない, 分枝は 6.2~25μ×2.1~2.8μ, 小型ペニシラスにては梗子の群生のみ, 基本梗子は 3~7ヵ幾分か緊密或は散開状に群生, 6.2~11.2μ×2.0~2.8μ, 梗子幾分か緊密に 6~8ヵ群生, 6.2~9.4μ×1.5~2.5μ, 比較的長く頂端部細い, 分生胞子楕円又は紡錘形, 2.5~3.5μ×2.1~2.5μ, 滑面, 又電子顕微鏡写真 (Fig E 19) にても滑面

スティープ寒天培養に於ける集落の発育は 25°C にて 5日目 22~33 mm, 10日目 47~60 mm, 20日目 68~80 mm, 30°C 10日目 52~60 mm, 37°C 発育不能, 一般的に分生胞子着生は豊富　暗濃色調他の諸特性は同上

亜硝酸寒天培養にては発育良好

本菌種は土壌及び他の自然物より分離さる

19. *Penicillium lilacinum* Thom

Colonies on Czapek agar more or less rapidly spreading, attaining a diameter of 41 to 55 mm in 10 to 12 days at 25°C (Fig C-19); 48 to 55 mm at 30°C; seldom growing at 37°C, (growing very well on NO_2-medium), floccose loose texture, central colony areas raised in some strains, not in others, shallow, radial furrows, at first white, gradually developing lilac to vinaceous shades near Light Congo Pink or Pale Vinaceous Pink with the production and ripening conidia, sporulation varying in different strains, generally abundant with a white margin about 0.5 to 1.0 mm in wide; exudate lacking or limitedly, colorless to vinaceous, odor slight or lacking; reverse usually vinaceous or vinaceous purple shades, becoming blackish red purple or brownish vinaceous shades, with surrounding agar pale similar shades; conidiophores arising from the substratum at colony margin and from aerial hyphae in central colony areas, varying sizes, 30 to 380μ or more by 1.8 to 3.0μ or 4.0μ, with apices somewhat enlarged up to 2.3 to 4.0μ, with smooth or nearly so walled and the others finely roughened, penicilli asymmetric strongly divaricate, varying in size and complexity (Fig M-19), bearing tangled chains of conidia up to 50 to 90μ in length, not branched in the usually manner for the genus, branches up to 6.2 to 25μ by 2.1 to 2.8μ, in smaller structures commonly consisting of a single verticil of metulae, metulae mostly 3 to 7 in verticil, mostly 6.2 to 11.2μ by 2.0 to 2.8μ, loosely compact or divergent, sterigmata mostly 6 to 8 in verticil, loosely compact, mostly 6.2 to 9.4μ by 1.5 to 2.5μ, abruptly tapering to a comparatively long, conidia elliptical or fusiform, 2.5 to 3.5μ by 2.1 to 2.5μ, smooth or nearly so walled, and the smooth or nearly so walls are shown by electron microscopy (Fig E-19)

Colinies on steep agar growing more rapidly, attaining a diameter of 47 to 60 mm in 10 to 12 days at 25°C, 52 to 60mm at 30°C, seldom growing at 37°C, texture and general colony appearance as on Czapek generally heavier sporing, hence in darker shades, the other characters as on Czapek Strains of this species isolated from soils and other natural sources

*Thom C U S Dept Agr, Bur Anim Ind Bul 118 72 75, fig 30 1910

**Raper, K B Thom C and Fennell, D I A Manual of the Penicillia pp 285-288 1949

***Abe, S J Gen Appl Microbiology 75 1956

20. *Penicillium janthinellum* Biourge

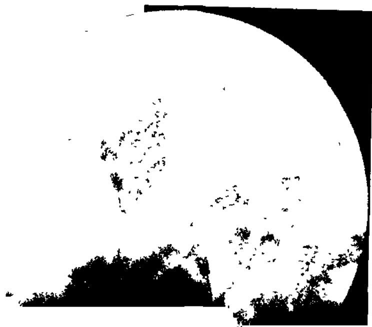


Fig. M-20. *Penicillium janthinellum*, FAT 1298, detail of penicilli.

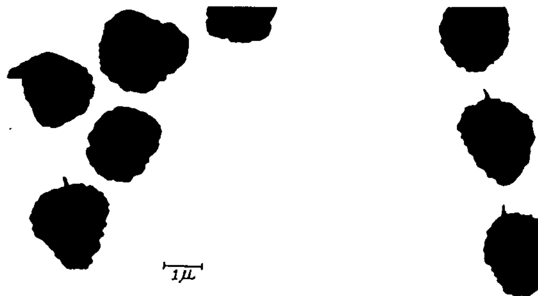
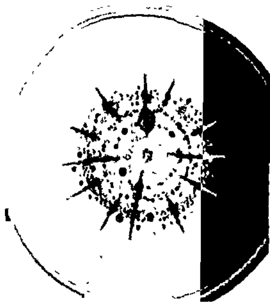


Fig. E-20 *Penicillium janthinellum* Biourge, FAT 1298, conidia showing the slightly rough walls and the ovate to subglobose form with ends often apiculate



C-20. *Penicillium janthinellum*, FAT 1298, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は25°Cにて5日目18~42mm，10日目38~74mm，20日目55~76mm，30°C 10日目，38~70mm；37°C，3~28mm，菌叢は似ビロード状或は似綿毛状，集落表面は僅か綿毛状様に発育，中央部或は不規則な又は放射状の皺を有し，菌株にて赤色，赤，桃，桃紫色等に着色又は無色，分生胞子の着生は遅く又不規則に各種に着色，黄緑 又は青緑色調，順次オリーブ，又はオリーブ褐色を呈す；滲出物は欠又は僅少，屡々豊富，無色又は黄，褐，桃，桃紫色；集落裏面は時に無色，特に次代の植継後の菌株では無色，新分離菌株では最初黄又は橙色，速やかに橙赤，赤，赤紫，又は赤褐色に部分的或は全面呈色；集落周辺寒天無色，桃紫，又は桃色調；ペニシラスは不整斉状著しい散開状，複雑各サイズ変化に富む，分生胞子連鎖縺状或は幾分か散開状，長さ30~160μ；分生胞子柄各種変化に富み，30~120μ又は時に500μ×1 2~2 8~3.8μ，頂端部幾分か膨大，1 8~3 8μ~4 7μ，滑面又は顆粒状，斑点状粗面，分枝，各種，6 2~20μ又は31μ×1 3~3 8μ；メトレ散開状に2~4ヵ群生，6 2~21μ×1 2~2 7又は4 4μ，頂端部多少膨大；梗子幾分か散開状或は緻密に3~8ヵ群生，下部は広巾であるが頂端部が急に細い，7 5~13 7μ×1 3~2 8μ，分生胞子，卵形又は亜球形，端が屡々尖る，滑面，2 1~3 7μ×1 8~3 1μ，又電子顕微鏡写真(Fig E-20)にても僅小な(0 1μ以下)粗面。

スティープ寒天培養に於ては25°Cにて5日目20~47mm，10日目，46~80mm，20日目，70~80mm；30°C，10日目，45~74mm，37°C，3~30mm；屡々，ツァペック寒天培養よりも一層濃呈色て，又一層単輪生状ペニシラスが少い，他の諸特性は同上。

亜硝酸寒天培養にては良好なる発育を示す。

本菌種は分布が広く，各地の土壌又は各試料より分離さる。

20. *Penicillium janthinellum* Biourge

Colonies on Czapek agar rapidly or broadly spreading, attaining a diameter of 38 to 74 mm in 10 to 12 days at 25°C (Fig C-20); 38 to 70 mm at 30°C; 3 to 28 mm at 37°C, (growing very well on NO_2-medium), velutinous or subfloccos, with surface growth delicately floccose, smooth or irregularly wrinkled in central portions and radially furrowed, red, pink or vinaceous mycelium produced in some strains and lacking in others, at first white, but in most strains variously colored from the tardy and irregular development of conidial areas, mostly in yellow green or blue green shades near Bice Green, Russian Green or Nickel Green, French or Dark yellowish Green, becoming similar shades or grayish olive brown shades, exudate lacking or limitedly, occasionally abundantly produced, colorless to yellowish, brownish, pinkish or vinaceous, reverse of colonies sometimes colorless, especially in stock cultures after many transfers, but usually in new isolate commonly yellow to orange at first, quickly changing to orange-red, maroon or red-purple or red-brown shades localized or throughout, with surrounding agar colorless vinaceous or pinkish shades, penicilli typically asymmetric, strongly divaricate varying in size and complexity, (Fig M 20) with conidial chains tangled or loosely divergent, commonly up to 30 to 160μ in length, conidiophores varying in compexity, to 30 to 120μ or sometimes 500μ in length by 1 2 to 2 8μ or 3 8μ in diameter, with apices somewaht enlarged up to 1 8 to 3 8μ or 4 7μ in diameter, with walls smooth or granular or punctate, branches variable, ranging from 6 2 to 20μ or 31μ by 1 3 to 3 8μ, metulae divergent, 2 to 4 in verticil, ranging from 6 2 or 21μ by 1 2 to 2 7μ 4 4μ, with apices more or less vesiculose, sterigmata loosely divergent or compact, 3 to 7 or 8 in verticil, enlarged at the *base then tapering abruptly to fairly long conidium* bearing tips, mostly 7 5 to 13 7μ by 1.3 to 2 8μ, conidia ovate to subglobose, with ends often apiculate and walls smooth or nearly so, commonly 2 1 to 3 7μ by 1.8 to 3 1μ, and the slightly rough walls are shown by electron microscopy (Fig E-20).

Colonies on steep agar growing somewhat more rapidly than on Czapek, 46 to 80mm in 10 to 12 days at 25 C, 45 to 74 mm at 30°C, 3 to 30 mm at 37°C, often more intensely colored with the shades present on Czapek more accentuated, conidial structures less commonly monoverticillate than on Czapek but other wise conforming to the above description

Strains of this species isolated from soils and samples of various places

*Biourge pll, Monograph La Cellule 33 fasc 1 pp 258 260 Col Pl VII and Pl XII fig 70 1923

**Thom, C The Penicillia pp 278 281 1930

***Raper, K B, Thom, C and Fennell, D I A Manual of thd Penicillia pp 299 303 1949

****Abe, S J Gen Appl Microbiology 76 77 1956

21. *Penicillium echinulo-nalgiovense* Abe.

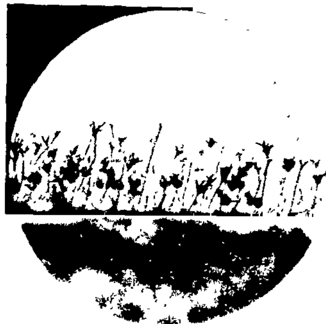


Fig. M-21 B. *Penicillium echinulo-nalgiovense* Abe, FAT 907, enlarged view of penicilli on colony section



Fig. M-21 A. *Penicillium echinulo-nalgiovense* Abe, FAT 907, low power view of colony section showing typically velvety character of texture

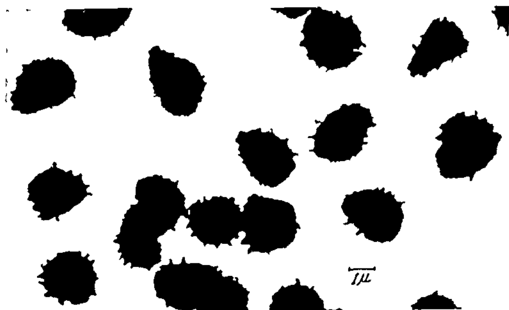


Fig. E-21. *Penicillium echinulo-nalgiovense* Abe, FAT 834, conidia showing the echinulate or verruculose walls and the ovate near strawberry from or subglobose form

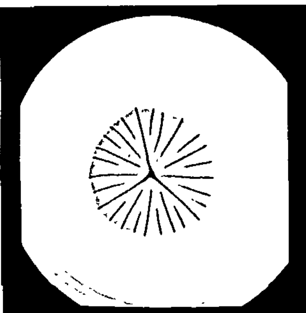


Fig. C-21. *Penicillium echinulo-nalgiovense* Abe, FAT 907, on Czapek agar, 10 days.

ツァペック寒天培養に於ける集落の発育は 25°C にて5日目 15~19 mm, 10 日目 36~37 mm (Fig. C-21); 20 日目 56~58 mm; 30°C, 10 日目 35~45 mm; 37°C, 発育不能; 菌叢ビロード状又は僅かに綿毛状, 放射状の皺があり, 集落周辺部は白色, 又は淡黄色, 10~20 mm 巾; 分生胞子着生部はオリーブ或は黄緑色, 順次灰黄緑色に変色, 滲出物は欠又は僅小, 無色; 集落裏面は赤色又は赤紫色, 集落周辺寒天は淡黄或は淡赤色, 分生胞子柄は基質又は基底菌糸より直立又は時々気菌糸より生育, 長短あり, 60~190 μ 又は 380 μ×2.5~3.3 μ, 頂端部 3.0~4.4 μ, 粗面, ペニシラス不整箒輪生状で著しい散開型, 時々分枝を有し基底梗子, 梗子を有し, 分枝子及び基底梗子は各種着生状を示し又各サイズも変化に富み (Fig M 21) 分枝は 10~20 μ 又は 25 μ×2.0~3.2 μ, 基底梗子は散開型, 9.3~15.6 μ 又は 20 μ×2.1~3.2 μ, 梗子は密集又は幾分か疎密で 3~7 ヵ群生 8.5~10.4 μ 又は 12.5 μ×2.1~3.4 μ 分生胞子卵形 (いちご形) 又は亜球形, 2.5~3.8 μ, 大刺又は疣状粗面, 分生胞子連鎖は円柱状又は幾分か錯状 長さ 30~70 μ 又は 130 μ, 分生胞子は電子顕微鏡写真 (Fig E-21) にても同様大刺 疣状粗面

スティープ寒天培養に於ける集落の発育は 25°C にて 5 日目 21~23 mm, 10 日目 47~48 mm, 20 日目 70~75 mm, 30°C, 10 日目 46~48 mm, 37°C 発育不能, 他の諸特性は同上

亜硝酸塩寒天培養にても良好なる発育を示す

本菌株は土壌より分離さる

21. *Penicillium echinulo-nalgiovense* Abe

Colonies on Czapek agar grow rather restrict edly, attaining a diameter of 36 to 37 mm in 10 to 12 days at 25°C (Fig C-21), 35 to 45 mm at 30°C; seldom growing at 37°C; (growing very well on NO_2-mediwm), velutinous or subfloccose, consisting of a farily close network of vegetative mycelia bearing crowded conidial structures; radially furrowed, with a white or pale yellow margin 10 to 20 mm wide, conidial areas in olive or yellow green shades near Oliv Oreen or Lincoln Green, becoming Citrine Drab with age; exudate lacking or limited colorless, odor limited moldy; reverse in typical reddish shades near Maroon, Victoria Lake or Hay's Maroon, with surrounding agar in pale yellow or light reddish shades; conidiophores arising primarily from the substratum or from basal felt, and sometimes from aerial hyphae, variable in length, commonly up to 60 to 190 μ or 380 μ long by 25 to 3.3 μ in diameter, typically rough-walled, and with apices 30 to 44 μ in diameter; penicili biverticillate, asymmetrical and strongly divaricate (Fig M 21), consisting variously of occasional branches metulae and sterigmata, with branches and metulae varying mark edly in arrangement and in size, branches variable, commonly 10 to 20 μ or 25 μ in length by 20 to 32 μ in diamteer, metulae typically divergent, 93 to 156 μ or 20 μ by 21 to 32 μ, sterigmata in compact or loosely compact verticils of 3 to 6 or 7, mostly 85 to 10.4 μ or 125 μ by 21 to 34 μ acute type, conidia ovate (near strawberry form) or subglobose, mostly 25 to 38 μ typically echinulate or verruculose walled, conidial chains usually columnar or loosely tangled up to 30 to 70 or 130 μ in length, and conidia with echinulate or verru culose walls as seen in electron microscopy (Fig E-21)

Colonies on steep agar rather more rapdily than on Czapek, 47 to 48 mm in 10 to 12 days at 25 C, 46 to 48 mm at 30 C, seldom growing at 37 C, the other characters are as described above

Strains of this species occurs fronm soils

*Abe S J Gen Appl Microbiology, pp 80 81 1956

22. *Penicillium canescens* Sopp

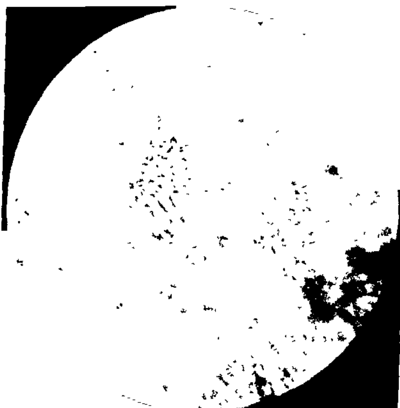


Fig. M-22. *Penicillium canescens* Sopp. FAT 832, detail of single penicillus

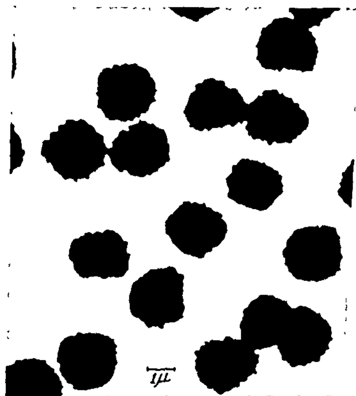


Fig. E-22. *Penicillium canescens* Sopp. FAT 832, conidia showing the delicately rough walls and the globose or subglobose form



Fig. C-22. *Penicillium canescens* Sopp, FAT 832, on Czapek agar, 10 days.

ツァペック寒天培養における集落の発育は25°Cにて5日目20~24mm, 10日目35~75mm (Fig C-22) 20日目, 60~78mm；30°C 10日目32~70mm, 37°C発育不能，菌叢は多少綿毛状, 放射状の皺があり, 集落周辺は白色, 2~4mm. 巾, 分生胞子着生部は青灰緑色, 順次灰オリーブ色を呈す. 滲出物は僅少, 無色又は淡褐色，集落裏面は5~6日目淡紫, 又は淡紫色, 順次黄又は濃橙褐色；或は赤褐色, 集落周辺寒天は淡紫, 半又は黄色調，ペニシラスは不整斉輪生状, 散開型で各種形状, サイズ, 着生状変化多し,(Fig M-22)，分生胞子柄は基質又は気菌糸より短く分岐, 60~300μ又は以上×2.5μ~3.5μ, 頂端は幾分か膨大 3.1~4.1μ, 顆粒状粗面，分枝 7.5~20μ×2.5~3.4μ，基底枝 2~4 カ散開状に着生, 9.3~15.6μ×2.5~3.4μ, 梗子 3~6 カ群生, 7.5~10μ×1.7~2.5μ, 比較的短く先端漸細い，分生胞子連鎖は粒状, 又は幾分か縺状, 長さ 30~100μ，分生胞子球形又は亜球形, 2.1~3.0μ, 時に大きく, 僅かな粗面, 電子顕微鏡写真 (Fig E-22) にても僅かな (0.1μ前後) の粗面

スティープ寒天培養における集落の発育は 25°Cにて5日目23~34mm, 10日目, 45~80mm, 20日目70~85mm, 30°C, 40~73mm；37°C 発育不能, 他の諸性状は同じ

亜硝酸寒天培養にては良好な発育を示す

本菌株は土壌より分離さる.

22. *Penicillium cenescens* Sopp

Colonies on Czapek agar attaining a diameter of 35 to 75 mm in 10 to 12 days at 25°C (Fig C-22); 32 to 70 mm. at 30°C; seldom growing at 37°C, (growing very well on NO_2-medium), with surface more or less floccose, radiately furrowed, with a white margin 2 to 4 mm wide, bluish gray green shades, becoming grayish olive, exudate limited colorless or pale amber, odor lacking or indefinite; reverse Pale Violet or Pale Hortense Violet in 5 to 6 days, becoming yellow, deep orange-brown or red brown shades, with surrounding agar pale lilac or dull yellow shades, penicilli abundantly produced, variable in size and complexity, strongly divaricate (Fig M-22), conidiophores arising from the substratum or short branches from aerial hyphae, up to 60 to 300 μ or more by 2.5 to 3.5 μ, with apices somewhat enlarged 3.1 to 4.1 μ with walls granular, branches usually about 7.5 to 20 μ by 2.5 to 3.4 μ; metulae divergent, 2 to 4 verticils, 9.3 to 15.6 μ by 2.5 to 3.4 μ; sterigmata in clusters of 3 to 6 or 10, mostly 7.5 to 10 μ by 1.7 to 2.5 μ, with definite conidium-bearing tips narrow but comparatively short, conidial chains column or loosely tangled, up to 30 to 100 μ, conidia globose or subglobose, mostly 2.1 to 3.0 μ, occasionally larger, with slightly roughened walled, and the delicately rough walls are shown by electron microscopy (Fig. E-22)

Colonies on steep agar growing more rapidly than on Czapek, about 45 to 80 mm in 10 to 12 days at 25°C, 40 to 73 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species occurs from soils

*Sopp, O., Monogr pp 181 182, Taf. XIX, fig 136, Taf XXIII fig 23 1912

**Thom, C., The Penicillia pp 347 349 1930

***Raper K B, Thom, C and Fennell D I, A Manual of the Penicillia, pp 316 319 1946

****Abe, S J Gen Appl Microbiology 81-82 1956

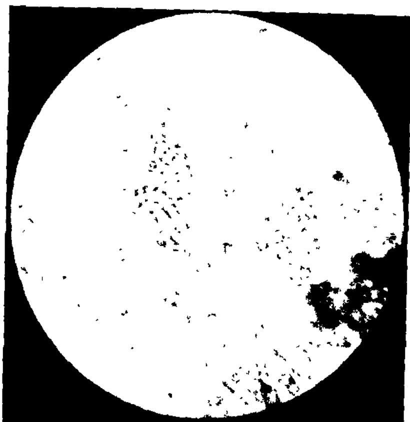


Fig. M-22. *Penicillium canescens* Sopp, FAT 832, detail of single penicillus

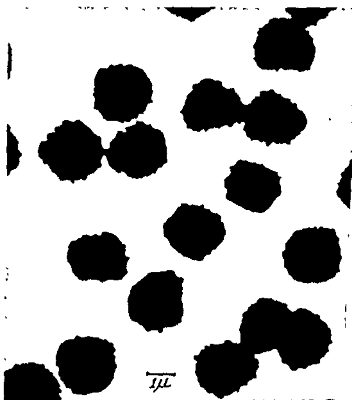


Fig. E-22. *Penicillium canescens* Sopp, FAT 832, conidia showing the delicately rough walls and the globose or subglobose form



Fig. C-22. *Penicillium canescens* Sopp, FAT 832, on Czapek agar, 10 days.

ツァペック寒天培養に於ける集落の発育は 25 C にて5日目20~24 mm, 10日目35~75mm (Fig C-22) 20日目, 60~78 mm; 30°C 10日目32~70mm, 37°C 発育不能，面毛は多少綿毛状，放射状の皺があり，集落周辺部は白色，2~4 mm 巾，分生胞子着生部は青灰緑色，順次灰オリーブ色を呈す，滲出物は僅少，無色又は淡褐色，集落裏面は 5~6 日目淡紫，又は淡紫色，順次黄又は濃橙褐色；或は赤褐色，集落周辺寒天は淡紫，紫又は黄色調；ペニシラスは不整箒輪生状，散開型で各種形状，サイズ，着生状変化多し. (Fig M-22)，分生胞子柄は基質又は気菌糸より短く分枝, 60~300μ 又は以上×2 5 μ~3.5 μ, 頂端は幾分か膨大 3 1~4 1 μ, 顆粒状粗面，分枝 7 5~20 μ×2 5~3 4 μ，基底梗子 2~4 ヵ散開状に着生，9 3~15 6 μ×2 5~3 4 μ; 梗子 3~6 ヵ群生 7 5~10 μ×1 7~2 5 μ, 比較的短く先端部細い，分生胞子連鎖は円柱，又は幾分か錯状，長さ 30~100 μ，分生胞子球形又は亜球形, 2 1~3 0 μ, 時に大きく，僅かな粗面，電子顕微鏡写真 (Fig E-22) にても僅かな (0 1 μ 前後) の粗面

スティープ寒天培養に於ける集落の発育は 25 C にて5日目 23~34 mm, 10日目, 45~80 mm, 20日目 70~85 mm, 30 C, 40~73 mm; 37°C 発育不能；他の諸性状は同じ

亜硝酸塩寒天培養にては良好な発育を示す。

本菌種は土壌より分離さる。

22 *Penicillium cenescens* Sopp

Colonies on Czapek agar attaining a diameter of 35 to 75 mm in 10 to 12 days at 25 C (Fig C-22), 32 to 70 mm at 30°C; seldom growing at 37°C; (growing very well on NO_2-medium), with surface more or less floccose, radiately furrowed, with a white margin 2 to 4 mm wide, bluish gray green shades, becoming grayish olive, exudate limited colorless or pale amber, odor lacking or indefinite; reverse Pale Violet or Pale Hortense Violet in 5 to 6 days, becoming yellow, deep orange-brown or red brown shades; with surrounding agar pale lilac or dull yellow shades; penicilli abundantly produced, variable in size and complexity, strongly divaricate (Fig M 22), conidiophores arising from the substratum or short branches from aerial hyphae, up to 60 to 300 μ or more by 2.5 to 3 5 μ, with apices somewhat enlarged 3 1 to 4 1 μ with walls granular; branches usually about 7 5 to 20 μ by 2 5 to 3 4 μ, metulae divergent, 2 to 4 verticils, 9 3 to 15 6 μ by 2 5 to 3 4 μ; sterigmata in clusters of 3 to 6 or 10, mostly 7 5 to 10 μ by 1 7 to 2 5 μ, with definite conidium bearing tips narrow but comparatively short, conidial chains column or loosely tangled, up to 30 to 100 μ, conidia globose or subglobose, mostly 2 1 to 3 0 μ, occasionally larger, with slightly roughened walled, and the delicately rough walls are shown by electron microscopy (Fig E-22)

Colonies on steep agar growing more rapidly than on Czapek, about 45 to 80 mm in 10 to 12 days at 25°C, 40 to 73 mm at 30 C, seldom growing at 37 C, the other characters as on Czapek

Strains of this species occurs from soils.

*Sopp, O., Monogr pp 181 182 Taf, XIX, fig 136, Taf XXIII fig 28 1912

**Thom, C., The Penicillia pp 347 348 1930

***Raper, K. B., Thom C and Fennell D I A Manual of the Penicillia, pp 316 319 1946

****Abe, S J Gen Appl Microbiology 81 82 1956.



23. *Penicillium jenseni* Zaleski

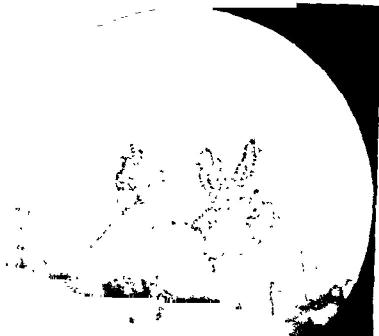


Fig. M-23. *Penicillium jensenii* Zaleski, FAT 770, detail of penicilli

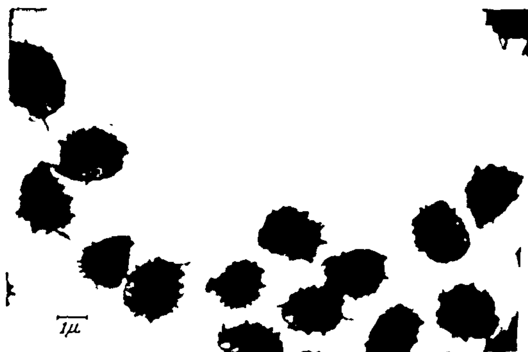


Fig. E-23. *Penicillium jensenii* Zaleski, FAT 770, conidia showing the delicately echinulate or verruculose walls and the *globose* to *subglobose* form

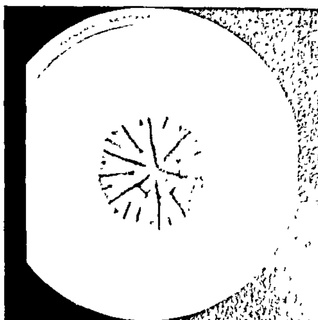


Fig. C-23. *Penicillium jensenı* Zaleskı, FAT [illegible] on C[illegible] agar, 10 days

ツァペック寒天培養に於ける集落の発育は25°Cにて5日目，約18 mm，10日目25～38 mm，20日目，約52 mm，30°C，10日目，約42 mm；37°C 発育不能；集落中心部は隆起又は凹み，放射状の皺があり，菌叢は幾分か綿毛状又は羊毛状，集落円周部は白色，1～2 mm 巾，分生胞子着生部は暗黄緑又は暗青緑；滲出物は欠；集落裏面は無色又は桃，黄色，集落周辺寒天は無色，ペニシラスは著しい散開型，屡々多分岐性，大型ペニシラスにては 2～3 コ又は以上の基底梗子を有し，小型では一般的に欠；分生胞子柄は変化に富み，100～380 μ 又は以上×2 0～2 8 μ，頂端部は幾分か膨大 2 5～3 5 μ，滑面；分枝は 7 5～20 μ×2 0～2 8 μ；基底梗子は 8 0～11 2 μ×2 0～2 8 μ，2～4 カ輪生，梗子は幾分か緻密に 5～7 カ簇生，7 5～9 6 μ×1 8～2 4 μ，分生胞子連鎖は幾分か円柱状，長さ 30～90 μ，分生胞子は球形又は亜球形，2 0～2 7 μ，僅かな粗面，又電子顕微鏡写真 (Fig E-23) にても僅かな粗面 (0 1 μ 前後)。

スティープ寒天培養に於ける集落の発育は 25°C にて5日目約 20 mm，10日目，約 38 mm；20日目，約 52 mm，30°C，約 45 mm，37°C にては発育不能；他の諸特性は同上。

亜硝酸培地上の発育は良好。

本菌種は土壌より分離さる。

23 *Penicillium jensenı* Zaleski

Colonies on Czapek agar [illegible] attaining a diameter [illegible] days at 25 C (Fig [illegible] seldom growing at [illegible] NO₂ medium, radial furrows [illegible] raised or depressed, subt[illegible] white margin 1 to 2 mm wide, [illegible] Sage Green or Pea Green to [illegible] Green with the ripening of conidia, [illegible] produced, odor lacking or indefinite [illegible] reverse uncolor to dull peach or yellow shades, with surrounding agar colorless, penicilli conspicuously divaricate, often appearing ramigenous, in larger structures usually consisting of a fairly definite terminal cluster of 2, 3, or more metulae, in smaller structures commonly not so arranged; conidiophores variable, up to 100 to 380 μ or more by 2 0 to 2 8 μ, with apices somewhat enlarged up to 2 5 to 3 5 μ, with walls smooth or nearly so, branches commonly variable, 7 5 to 20 μ by 2 0 to 2 8 μ, metulae variable, commonly 8 0 to 11 2 μ by 2 0 to 2 8 μ, 2 to 4 in verticil; sterigmata usually in clusters of 5 to 7, loosely compact, 7 5 to 9 6 μ by 1 8 to 2 4 μ; conidial chains loosely column, up to 30 to 90 μ in length, conidia globose to subglobose, 2 0 to 2 7 μ, with walls delicately roughened, and the delicately echinulate or verruculose walls are shown by electron microscopy (Fig E -23)

Colonies on steep agar attaining a diameter of about 38 mm. in 10 to 12 days at 25°C; about 45 mm at 30°C; seldom growing at 37°C; the other characters as on Czapek.

Strains of this species occurs from soils

*Zaleski, K, Bul Acad Polonaise Sci Math et Nat Ser B, pp 494 495, Taf 57 1927.

**Thom, C, The Penicillia, pp 346-347, 1930

***Raper, K B, Thom, C and Fennell, D I, A Manual of the Penicilla, pp 322 323 1949

****Abe, S, J. Gen, Appl. Microbiology p 82 1956

24. *Penicillium nigricans* (Bainier) Thom

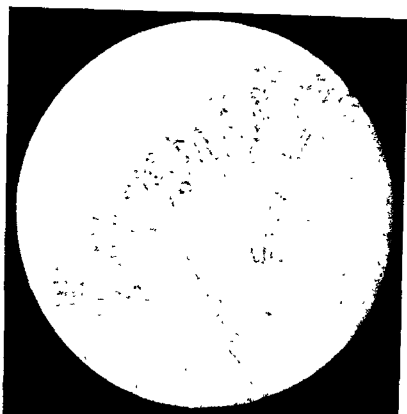


Fig. M-24. *Penicillium nigricans* (Bainier) Thom, FAT 919, detail of penicilli

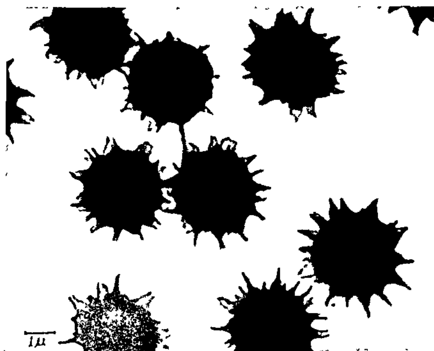


Fig. L-24 *Penicillium nigricans* (Bainier) Thom, FAT 919, conidia showing the aculeate walls and the globose or subglobose form

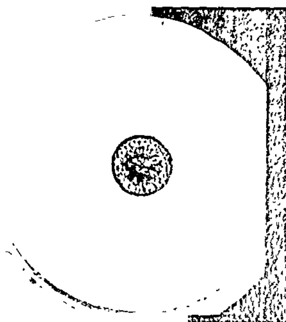


Fig. C-24. *Penicillium nigricans* (Bainier) Thom, FAT 9[illegible], on Czapek agar 10 days

ツァペック寒天培養に於ける集落の発育は25°Cにて5日目約12mm, 10日目22~30mm (Fig C-24) 20日目約40mm; 30°C, 10日目約14mm; 37°C 発育不能; 菌叢ビロード状或は近似的, 平面的に或は放射状皺を有し, 集落円周部は白色, 約0 5 mm 巾; 分生胞子着生部は灰, 黒灰, オリーブ灰, 又は暗灰オリーブ色, 順次同一色調又はオリーブ黒色を呈す; 集落裏面は橙, 褐赤, 赤褐色, 順次赤色調, 集落周辺寒天は黄橙, 赤橙色; 滲出物は豊富無色或は僅かに黄色調, ペニシラスは不整斉輪生状, 著しい散開型 (Fig M 24), 分生胞子柄長さ変化に富み, 屡々短く, 90~250 μ×25 ~4 2 μ, 頂端部幾分か膨大し, 4 0~5 0 μ, 滑面; 分枝は変化に富み, 18~31 μ×2 8~3 4 μ, 頂端部 4 3~5 6 μ, 基底梗子は著しい散開型, 6 2~12 5 μ×2 0~3 2 μ, 一般的に膨大型に着生し, 各各単輪状類似の緻密な梗子を有す; 梗子は通常多少散開状に5~10カ群生し, 6 2~7 5 μ×2 3~3 0 μ; 分生胞子は2 3~3 1 μ 或は3 5 μ, 球形又は亜球形, 長大刺状粗面, 又電子顕微鏡写真にても (Fig E-24), 0 3 μ 以上の長大刺状粗面, 分生胞子連鎖は屡々並行状, 通常, 散開状又は縺状, 長さ50~80 μ.

スティープ寒天培養にての集落の発育は25°Cにて5日目約14 mm, 10日目約26 mm, 20日目約47 mm; 30°C 10日目約19mm; 37°C 発育不能, 他の諸特性は同上。

亜硝酸寒天培養にては発育不能。

本菌株は土壌より得られる。

24. *Penicillium nigricans* (Bainier) Thom

Colonies on Czapek agar grow[illegible] rather [illegible] ctedly, 22 to 30 mm in 10 to [illegible] days at [illegible] (Fig C-24); about 14 mm at 30 C, seldom gro[illegible] at 37°C, (growing little or not on NO_2 medium), velvety or nearly so, plane or [illegible] furrowed, with a white margin about 0 5 mm [illegible] areas in various shades of gray [illegible] y, d olive gray, and Dark Grayish Olive [illegible] com Mouse Gray or Olivaceous Black, re[illegible] dce orange to deep feruginous or red brown [illegible] coming reddish shades, with surrounding agar yellow orange to reddish orange shades, odor strongly, suggesting certain species of Actinomyces, exudate abundantly, colorless or slightly yellowish; penicilli arymmetric conspicuosly divaricate (Fig M-24), conidiophores variable in length, often very short, 90 to 250 μ by 2 5 to 4 2 μ, with apices somewhat enlarged up to 4 0 to 5 0 μ, with walls smooth or nearly so; branches variable, 18 to 31 μ by 2 8 to 3 4 μ, with apices 4 3 to 5 6 μ in diameter, metulae strongly divergent, variable, about 6 2 to 12 5 μ by 2 0 to 3 2 μ, with each typically supporting a compact verticil of sterigmata simulating commonly inflated a monoverticillate head, sterigmata usually borne in clusters of 5 to 10, more or less divergent, about 6 2 to 7 5 μ by 2 3 to 3 0 μ, conidia 2 3 to 3 1 or 3 5 μ in diamter, globose or subglobose, with walls aculeate and the aculeate walls are shown by electron microscopy (Fig E-24), conidial chains occasionally parallel but usually divergent or tangled, 50 to 80 μ in length

Colonies on steep agar grownig about 26 mm in 10 to 12 days at 25°C, about 19 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species occurs from soils

*Thom, C. The Penicillia, pp 351 353 1930

**Raper, K B Thom, C and Fennell, D I, A Manual of the Penicillia, pp 325-329 1949

***Abe, S J Gen Appl Microbiology pp 82-83 1956

25. *Penicillium melinii* Thom

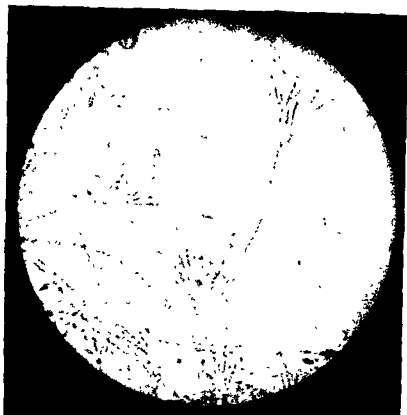


Fig. M-25. *Penicillium melinii* Thom, FAT 581, detail of penicilli.

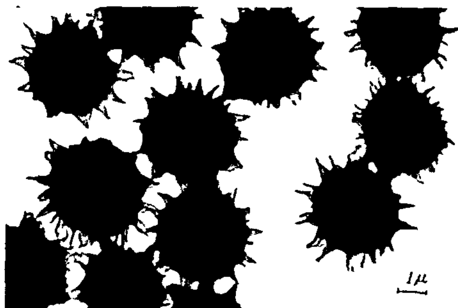


Fig. F-25. *Penicillium melinii* Thom FAT 581, conidia showing the aculeate walls and the globose form

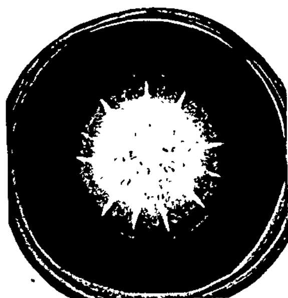


Fig. C-25. *Penicillium melinii* Thom, FAT 581, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C にて 5 日目 24~30 mm, 10 日目約 51~52 mm; 20 日目 55~67 mm; 30°C 10 日目 45~50 mm, 37°C 発育不能; 菌叢はビロード状, 緻密な菌叢で, 多くの菌株には豊富なペニシラスを有する硬い基礎交錯菌糸帯を有す, 著しい放射状の皺を有し, 又中心部が隆起す; 集落周縁部は白色, 1.5~2.0 mm 巾, 分生胞子着生部は黄緑又はクスンダ緑色, 順次灰緑, 灰暗オリーブ色を呈す, 滲出物は欠或は豊富, 橙黄色, 又は暗褐色調; 集落裏面は黄, 橙黄, 暗褐, 又は紫褐色調; 集落周辺寒天は同一様色調呈色, ペニシラスは変化に富み, 不整斉輪生状, 著しい散開型 屡々単輪状を呈すが, 併し散開状の不均一な分枝, 基底梗子の群生を有す, 分生胞子柄は各種の長さで, 30~150 μ 又は 120 μ×1.9~3.1 μ 又は 3.6 μ 頂端部は幾分か膨大し, 3.1~4.4 μ, 横壁は顆粒状又は瘤状粗面, 分枝は 10~30 μ×1.9~3.6 μ, 基底梗子は著しい散開状に 2~4 ヵ輪生, 8.9~15.6 μ 又は, 20 μ×1.8~2.5 μ 又は 3.4 μ, 顆粒状, 又は斑点状粗面, 梗子は緻密又は幾分か散開状に 5~10 ヵ群生し, 6.2~8.1 μ×1.5 μ~2.5 μ, 中心部は巾広く, 頂端部は急に細い, 分生胞子連鎖は 錯な縺状或は散開形, 長さ 30~120 μ, 分生胞子球形, 1.8~3.0 μ 又は 3.5 μ 長大刺状粗面, 又電子顕微鏡写真 (Fig E 25) にても長大刺状粗面

スティープ寒天培養に於ける集落の発育は 25 C にて 5 日目 26~31 mm, 10 日目 52~59 mm, 20 日目 0~70 mm, 30 C, 10 日目 48~60 mm, 37 C 発育不能, 他の諸特性は同上。

亜硝酸寒天培養にてはツァペック寒天同様に良好な発育を示す

本菌種は土壌より分離さる。

25. *Penicillium melinii* Thom

Colonies on Czapek agar growing rather slowly or rapidly spreading, attaining a diameter of 51 to 52 mm in 10 to 12 days at 25°C (Fig C-25); about 45 to 50 mm at 30°C; seldom growing at 37°C, (growing very well on NO_2-medium); velvety or velutinous, close-texture, consisting of a tough basal felt bearing abundant conidial structures in most strains, strongly wrinkled in radiall pattern, raised in central area, growing margin narrow, white, 1.5~2.0 mm wide shading quickly to yellow-green or dull green shades near Andover, gnaphalium becoming gray-green to deep grayish olive; odor moldy, not pronounced; exudate lacking or abundantly, orange yellow to deep brown shades; reverse yellow to orange yellow, deep brown or purplish brown shades, with surrounding agar similar shades pigmented, penicilli variable, asymmetric conspicuously divaricate, occassionally monoverticillate but frequently consisting of a terminal group of diverging and unequal branches or metulae, conidiophores variable in length, 30 to 150 μ or 200 μ by 1.9 to 3.1 μ or 3.6 μ, with apices somewhat enlarged up to 3.1 to 4.4 μ, walls typically granular or tuberculate, branches variable, 10 to 30 μ by 1.9 to 3.6 μ metulae strongly divergent, 2 to 4 in verticil, mostly 8.9 to 15.6 μ or 20 μ by 1.8 to 2.5 μ or 3.4 μ with walls granular or slightly punctate; sterigmata in clusters of 5 to 10, compactly or somewhat divergent arranged, mostly 6.2 to 8.1 μ by 1.5 to 2.5 μ, broadest in central area with apices abruptly narrowed bearing conidia in chains up to 30 to 120 μ in length, loosely tangled or divergent; conidia globose, about 1.8 to 3.0 or 3.5 μ in diameter with walls aculeate, and the aculeate walls are shown by electron microscopy (Fig E-25)

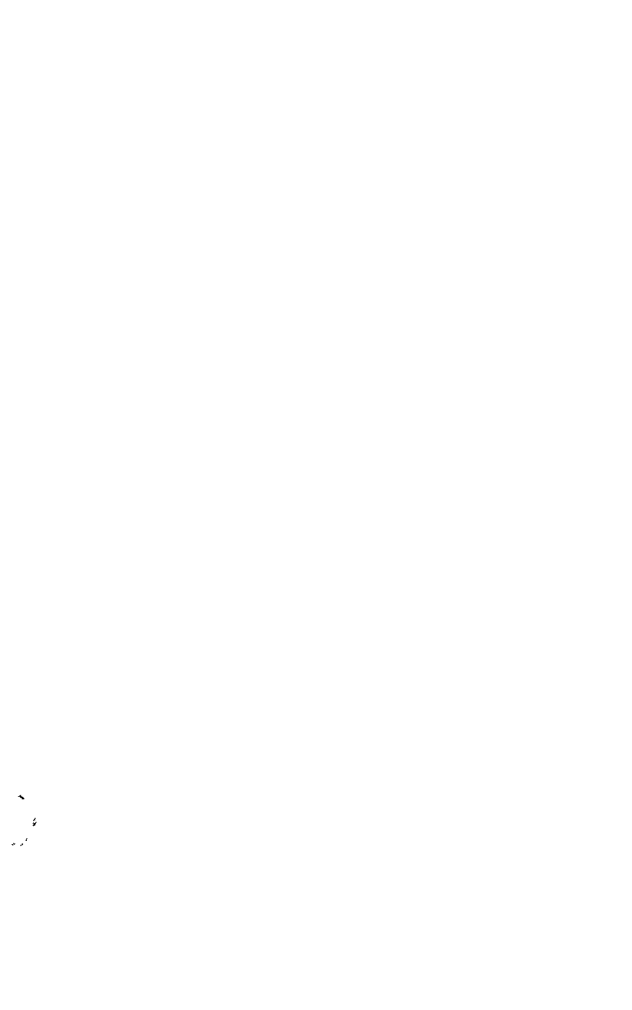
Colonies on steep agar growing more rapidly, about 52 to 59 mm in 10 to 12 days at 25 C, 48 to 60 mm at 30°C, seldom growing at 37 C, the others characters as described above

Strains of this species occurs from soils

*Thom C, The Penicillia p 273 1930

**Raper K B Thom C and Fennell D I A Manual of the Penicillia, pp 331 332 1949

***Abe, S, J Gen Appl Microbiology p 84 1956



26. *Penicillium citrinum* Thom



Fig. M.26 A. *Penicillium citrinum* Thom, FAT 513, detail of penicilli



Fig. M-26 B. *Penicillium citrinum* Thom, FAT 513, low power view of conidial chains

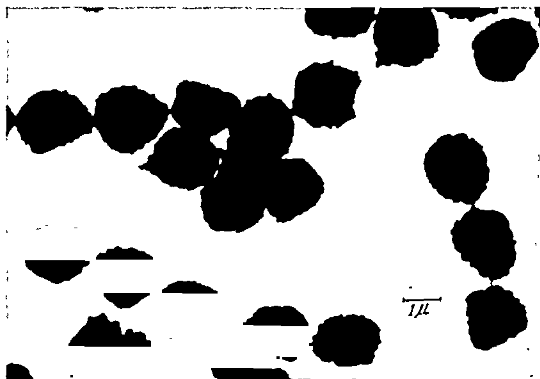


Fig. E-26. *Penicillium citrinum* Thom, FAT 513, conidia showing the slightly rough walls and the globose to subglobose form

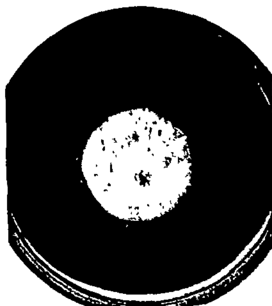


Fig C-26. *Penicillium citrinum* Thom, FAT 517, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は25°Cにて5日目12~26 mm, 10日目32~48 mm, (Fig C-26) 20日目41~73 mm, 30°C, 10日目28~54 mm, 37°C 特長的に発育不能，集落は明確に又は軽るい放射状の皺を有し，菌叢ビロード状，又は幾分か綿毛状，集落円周部は白色，0.2~2.0mm 巾，分生胞子着生部は青緑又は黄緑色調，順次灰緑，オリーブ緑色，滲出物は欠，又は僅小，輝，或は淡黄色調，集落裏面は通常輝黄色，橙，橙褐色，又時には桃色調，集落周辺寒天は同一色調，又或る菌株にては無色なれども，試験管斜面培養では前記色調；ペニシラスは不整斉輪生状，分枝を有せず (Fig. M 26)，分生胞子柄は通常基質より生育し，60~130μ又は230μ×2.1~2.8μ或は3.7μ，頂端部幾分か膨大3.0~4.1μ又は5.6μ，滑面，基底梗子緻密又は幾分か散開形に2 6ヵ群生，10~16μ又は23μ×2.1~3.4又は4.3μ，頂端部膨大し3.0~6.2μ；梗子並行状又は緻密に3~8~10ヵ着生，7.5~11.6μ又は12.5μ×1.5~2.4μ或は3.0μ，分生胞子は球形又は亜球形，1.5~2.8μ或は3.3μ，滑面，又電子顕微鏡写真 (Fig E-26) にては僅小な粗面，分生胞子連鎖は円柱状，長さ60~120μ又は300μ.

スティープ寒天培養に於ける集落の発育は 25°C 5日目16~31 mm, 10日目37~57 mm，20日目60~76 mm，30°C 10日目41~64 mm，37°C, 発育不能，他の諸特性は同上，亜硝酸曹達寒天培養にてはツァペック寒天培養同様に良好なる発育を示す。

本菌種は各種の土壌，塵埃，綿，又は他の織物，日常の食品，タバコ，毛皮品，病変米，遅い加水分解を行いつつある各種の野菜類，果実，等より分離され，分布が広い。

26 *Penicillium citrinum* Thom

Colonies on Czapek agar growing restrictedly or rapidly, generally 32 to 48 mm in 10 to 12 days at days at 25°C (Fig C-26), 28 to 54 mm at 30°C; seldom growing at 37°C; (growing very well on NO_2-medium), typically or slightly furrowed in a radial pattern, velvety in most strains, more or less floccose in some, with a white margin about 0.2 to 2.0 mm in wide, conidial areas in blue green or yellow green shades near Artmesia Green or Bluish Gray Green, Dusky Yellowish Green, Blackish Green, becoming similar shades or grayish, olivish green shades; exudate lacking or limitedly, bright or pale yellow shades, pronounced mushroom odor in some strains, not made in others; reverse usually in bright yellow to orange, orange brown, and sometimes pinkish shades; with surrounding agar similar shades pigmented in most strains, colorless in some strains but usually pigmeted on agar slant; penicilli typically biverticillate and asymmetrica, seldom producing of branches (Fig M-26); conidiophores usually arising mostly from the substratum, mostly 60 to 130 μ or 230 μ by 2.1 to 2.8 μ or 3.7 μ, with apices somewhat enlarged up to 3.0 to 4.1 μ or 5.6 μ in diameter, with smooth or nearly so walled, metulae compact or somewhat divergent, 2 to 6 in verticil, mostly 10 to 16 μ or 23 μ by 2.1 to 3.4 μ or 4.3 μ, with apices larger up to 3.0 to 6.2 μ, sterigmata parallel or compact, 3 to 8 or 10 in verticil, measuring about 7.5 to 11.6 or 12.5 μ by 1.5 to 2.4 or 3.0 μ; conidia typically globose to subglobose, 1.5 to 2.8 or 3.3 μ, with smooth or nearly so walls, and the slightly rough walls are shown by electron microscopy (Fig E-26), conidial chains typically column, up to 60 to 120 μ or 300 μ in length

Colonies on steep agar growing more rapidly, attaining a diameter of 37 to 57 mm in 10 to 12 days at 25°C, 41 to 64 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species occurs from soils or dust borne contamination including cotton and other fabrics, dairy and food products, tobacco, leather goods, diesease rice, and various vegetable materials undergoing slow decompositon

*Thom C U S Dept Agr Bur Anim Ind Bull 118, pp 61 63 fig 22 1910, Op cit pp 250 257 fig 31 1930

**Raper, K B, Thom, C and Fennell, D I, Op cit pp 345 350 1945

***Abe, S, J Gen Appl Microbiology 85 86 1956

27. *Penicillium corylophilum* Dierckx

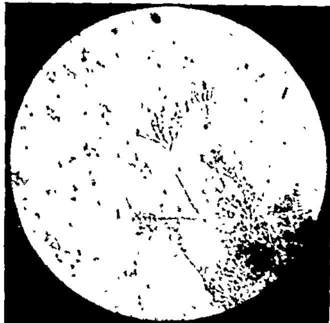


Fig. M-27 A. *Penicillium corylophilum* Dierckx, FAT 706, detail of penicilli.



Fig. M-27 B. *Penicillium corylophilum*, FAT 706, detail of the single penicillus

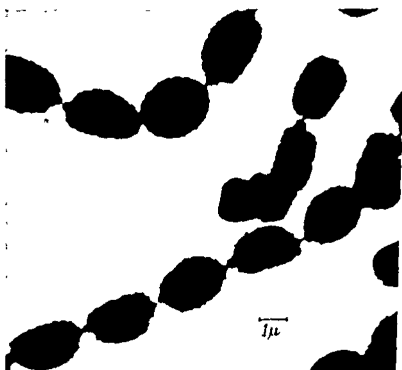


Fig. E-27. *Penicillium corylophilum* Dierckx, FAT 706, conidia showing the slightly rough walls and the elliptical to subglobose form

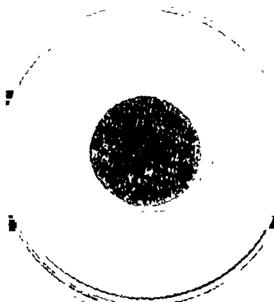


Fig. C-27. *Penicillium corylophilum* Dierckx FAT 644, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は25°C にて5日目13~30 mm, 10日目34~47 mm (Fig. C-27) 20日目52~65 mm; 30°C, 10日目 31~45 mm, 37°C 特異的に発育不能，菌叢はビロード状又は僅かに綿毛状，平滑，僅かに或は明確に放射状の皺を有し，集落周縁部は白色，0.3~1.0 mm 巾，分生胞子着生部は青緑色又は黄緑色調漸次オリーブ褐色或は暗黄緑色を呈す，滲出物は欠或は豊富，無色或は黄色調，集落裏面は褐色，又は褐黒色調，集落周辺寒天は無色或はくすんだ，淡黄色調，分生胞子柄は基質より直立し，一般的に分岐せず 120~280 μ 或は 380 μ×1.8~3.1 μ 或は 4.3 μ，頂端部幾分か膨大し3.0~4.4 μ 或は5.6 μ，滑面，ペニシラスは形，サイズは変化に富み，不整斉輪生状，時々単輪生状様ペニシラスが多い，基底梗子は 2~3，時に5ケ群生し，10.6~18.7 μ×2.1~3.7 μ，頂端部幾分か膨大し，2.1~3.7 μ，梗子4~8ヵ着生し，7.5~12.5 μ×1.5~2.5 μ，分生胞子楕円又は亜球形，1.8~3.1 μ×1.5~2.5 μ，滑面，電子顕微鏡写真 (Fig. E 27) にては0.1 μ 以下の僅小なる粗面，分生胞子連鎖は縺状，或は円柱状，長さ30~90 μ 又は 190 μ (Fig. M 27B)

スティープ寒天培養に於ける集落の発育は25°C にて 5日目18~38 mm，10日目 40~67 mm 20日目57~75 mm 30°C, 10日目30~57 mm，37°C 発育不能，他の諸性質は同じ

亜硝酸寒天培養にてはツァペック寒天同様良好なる発育を示す

本菌種は土壌又は各種腐敗物より分離される

27. *Penicillium corylophilum* Dierckx

Colonies on Czapek agar growing somewhat restrictedly, attaining a diameter of 34 to 47 mm in 10 to 12 days at 25°C (Fig C-27), 31 to 45 mm at 30°C; seldom growing at 37°C; (growing very well on NO_2-medium); typically velvety or slightly subfloccose, smooth, slightly or typically furrowed in a radial pattern, with a white margin 0.3 to 1.0 mm. in wide, conidial areas in blue green or yellow green shades near Dark Greenish Glaucous or Pistachio Green, Andover Green, become olive brown or dark dull yellow Green, exudate limitedly or abundantly, colorless or yellow shades; odor evident but not distinctive, reverse in brownish or fuscous shades with surrounding agar colorless or dull yellow, or lighter similar shades; conidiophores arising mostly from the substratum, generally unbrached, 120 to 280 μ or 380 μ by 1.8 to 3.1 μ or 4.3 μ, with apices somewhat enlarged up to 3.0 to 4.4 μ, or 5.6 μ with walls smooth or nearly so, penicilli variable in form and dimensions, typically biverticillate and asymmetric (Fig M 27A) but with monoverticillate structures sometimes predominating, penicilli typically consisting of 2 to 3 or 5 metulae, variable in length, mostly 10.6 to 18.7 μ by 2.1 to 3.7 μ, with apices somewhat enlarged up to 2.1 to 3.7 μ, each supporting a group of 4 to 8 sterigmata measuring about 7.5 to 12.5 μ by 1.5 to 2.5 μ, conidia elliptical to subglobose, mostly 1.8 to 3.1 μ by 1.5 to 2.5 μ, with walls smooth or nearly so, and the slightly rough walls are shown by electron microscopy (Fig. E 27), conidial chains tangled or loosely 30 to 90 μ or 190 μ in length (Fig M 27B)

Colonies on steep agar growing somewhat rapidly, 40 to 67 mm in 10 to 12 days at 25 C, 30 to 57 mm at 30 C, seldom growing at 37 C, the other characters as on Czapek

Strains of this species from soils and deteriorating materials

*Dierckx, R P Soc Sci Brux 25 86 1901

**Biourge PH Monograph La Cellule 33 fasc 1, pp 266 2da, Col Pl IX and Pl XIV fig 83 1923

***Thom C, The Penicillia, pp 254 255 1930

****Raper, K B, Thom C and Fennell, D I Op cit pp 341 345 1949

*****Abe, S, J Gen Appl Microbiology pp 88 89 1956

28. *Penicillium paxilli* Bainier

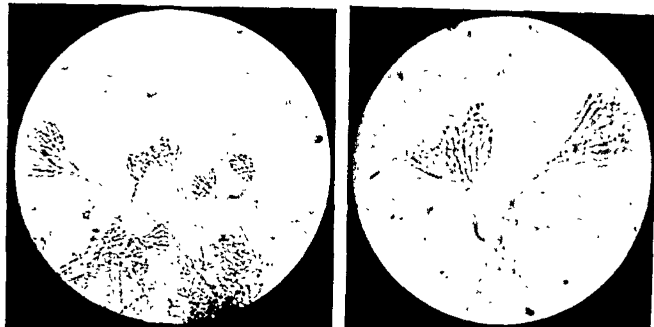


Fig. M-28 A, B. *Penicillium paxilli* Bainier, FAT 1286, detail of penicilli.

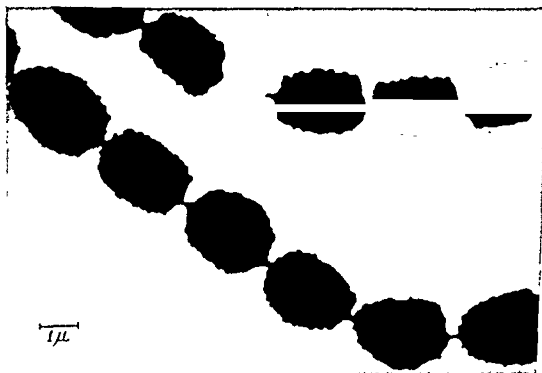


Fig. L-28. *Penicillium paxilli* Bainier, FAT 1286, conidia showing the slightly rough walls and the elliptical to ovate form

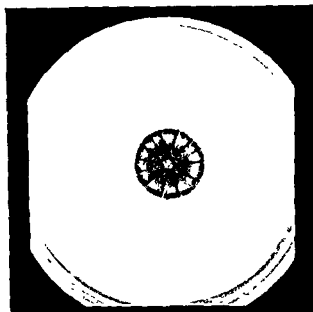


Fig. C-28 *Penicillium paxilli* Bainier, FAT 1286, on Czapek agar, 10 days

28 *Penicillium paxilli* Bainier

ツァペック寒天培養に於ける集落の発育は 25°Cにて5日目約 16 mm, 10日目約 30 mm (Fig C-28), 20日目, 約47 mm, 30°C 10日目約 22 mm, 37°C 特長的に発育不能・菌叢はビロード状, 平面又は放射状の皺があり, 集落周辺部は白色, 約0 2 mm 巾, 分生胞子着生部は暗又はクスンダ黄緑色調, 順次暗オリーブ緑色を呈す, 滲出物は僅少又は豊富, 無色；集落裏面はくすんだ黄色調, 集落周辺寒天は無色, ペニシラスは不整斉輪生状, 併し分枝は有せず (Fig. M-28), 分生胞子柄は基質より叢生に直立し, 又時々気菌糸より分枝し生育す, 120～240 μ×3 1～4 0 μ, 頂端部幾分か膨大4 0～4 7 μ, 滑面, 基底梗子5～8, 輪生に群生, 9 3～12 5 μ×2 8～3 6 μ, 均一なサイズで, 又頂端部僅かに膨大し, 3 0～4.3 μ, 梗子は輪生に4～6ヵ着生, 8 0～10 μ×2 1～2 5 μ, 分生胞子は楕円又は卵形, 2 5～3 4 μ×1 8～2 5 μ, 滑面, 電子顕微鏡写真 (Fig E-28) にては僅小 (0 1 μ 以下) な粗面・分生胞子連鎖は縺状又は散開状, 長さ 60～180 μ

スチープ寒天培養に於ける集落の発育は 25°C にて5日目約20 mm；10日目約35 mm, 20日目約48 mm, 30°C 10日目約 34 mm；37°C 発育不能，他の諸性状は同じ

亜硝酸塩寒天培養に於いてはツァペック寒天同様に良好なる発育を示す。

本菌種は土壌及び腐敗物より分離さる。

Colonies on Czapek agar growing rather restrictedly, attaining a diameter of about 30 mm. in 10 to 12 days at 25°C (Fig C-28), about 22 mm at 30°C, seldom growing at 37°C, (growing very well on NO_2-medium); velvety, plane or radial furrowed, with a white margin about 0 2 mm in width, conidial areas in dark or dull yellow green shades near Pea Green, Sage Green, becoming darker olive green shades near Andover Green; exudate limitedly or abundant, colorless; odor "moldy", not pronounced; reverse in dull yellow shades, with surrounding agar colorless; penicilli asymmetric and biverticillate, but seldom producing branches (Fig M 28), conidiophores borne in a dense stand arising primarily from the substratum, sometimes as branches from aerial hyphae, variable in length but commonly 120 to 240 μ by 3 1 to 4 0 μ, with apices somewhat enlarged up to 4 0 to 4 7 μ in diameter, with walls smooth or nearly so; metulae compact, 5 to 8 in verticil, mostly 9 3 to 12 5 μ by 2.8 to 3 6 μ, uniform in diametr or with apices only slightly enlarged, up to 3 0 to 4.3 μ in diameter, sterigmata compact, 4 to 6 in verticil, mostly 8 0 to 10 μ by 2 1 to 2 5 μ, conidia elliptical or ovate, mostly 2.5 to 3 4 μ by 1.8 to 2 5 μ, with walls smooth or nearly so, and the slightly rough walls are shown by electron microscopy (Fig E-28), and the conidial chains tangled or divergent, up to 60 to 180 μ in length.

Colonies on steep agar growing somewhat more rapidly than on Czapek, about 35 mm in 10 to 12 days at 25 C, about 34 mm at 30 C, seldom growing at 37 C, the other characters as on Czapek

Strains of this species occurs from soils and deteriorating materials

*Bainier, G, Bul Soc Mycol France 23 95 96, Pl X, figs 1 4 1907

**Thom, C The Penicillia, pp 294 296 1930

***Raper, K B, Thom, C and Fennell, D I, Op cit pp 414 416 1949

****Abe S J Gen Appl Microbiology p 90 1956

29. *Penicillium chrysogenum* Thom

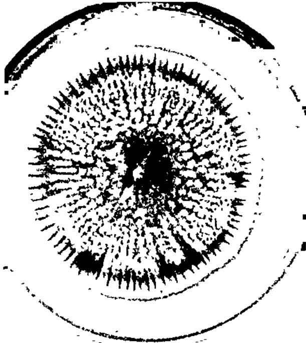


Fig. C-29A. *Penicillium chrysogenum* Thom, FAT 533, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25℃, 5日目 19~40 m, 10日目 37~58 mm, (Fig C-29 A), 20日目 46~73 mm; 30℃, 10日目 27~47 mm; 37℃ 発育不能; 集落表面は車輪の如き放射状の皺があり, 菌叢はビロード状又は綿状或は僅かに綿毛状, 集落周縁は白色, 0.8~3.0 mm 巾; 分生胞子着生は多くの菌株にては全面的に, 或る菌株にては黄又はクリーム色の菌糸が中心部に残る傾向がある. 分生胞子着生部は黄緑, 又は青緑色調, 順次同一色調か又はあせた黄緑又は青緑色調を呈す, 滲出物は僅少又は豊富,

29. *Penicillium chrysogenum* Thom

Colonies on Czapek agar growing rapidly, attaining a diameter of 37 to 58 mm. in 10 to 12 days at 25 C (Fig C-29 A), 27 to 47 mm at 30 C; seldom growing at 37 C; (growing little or not on NO_2-medium), surface conspicuous radial furrows which lend to the colony a wheel like appearance, velvety or velutinous subfloccose, with a white margin about 0.8 to 3.0 mm in wide, heavily sporing throughout in most strains, in others often showing some tendency to remain steril in central areas with vegetative mycelium yellowish to cream colored, conidial areas in yellow green or blue green shades near Dark American Green, Dark Porcelain Green, Dark Russian Green, Bluish Gray Green, becoming to similar shades or Andoverer green or Artmesia Green or Lily Green; exudate limitedly or abundantly, pale or bright yellow shades, odor lacking or indefinite; reverse bright or dull yellow shades throughout and sometimes pale brownish in central areas, with surrounding agar strongly or pale yellow shades pigmented; penicilli biverticillate and asymmetrical, commonly showing one or more branches in addition to the main axis (Fig M 29) terminating in verticils of 2 to 5 or 7 metulae bearing sterigmata; conidial chains usually in well-defined columns commonly 60 to 200 μ in length; conidiophores arising primarily from the substratum in a dense stand, variable in length, commonly

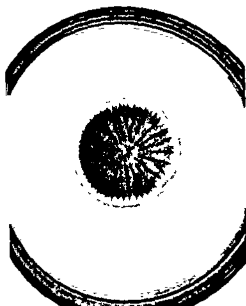


Fig C-29B. *Penicillium chrysogenum* Q 176, on Czapek agar, 10days

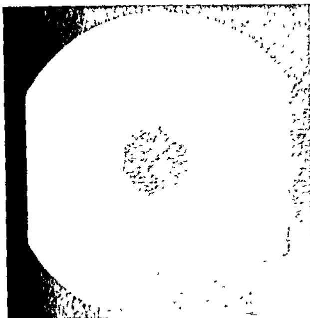


Fig C-29C F·

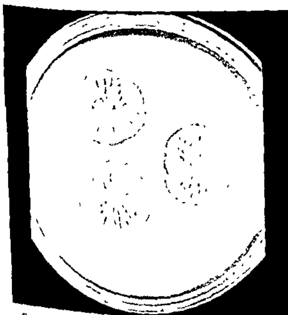


Fig. C-29D *Penicillium chrysgenum* Q 176 albino type strain, on Czapk agar, 10 days

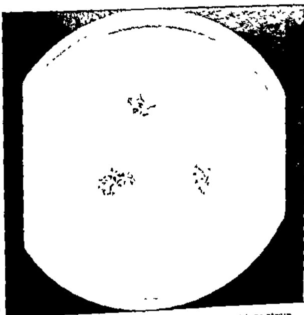


Fig. C-29E. *Penicillium chrysogenum* Q 176 yeast type strain, on Czapek agar, 10 days

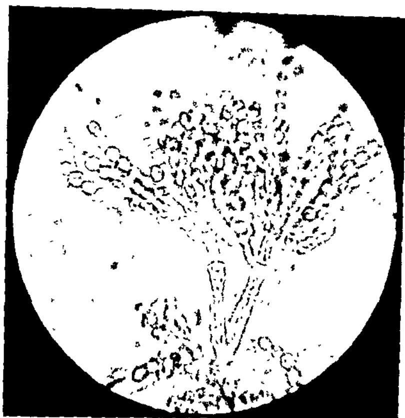


Fig. M-29 C. *Penicillium chrysogenum* Q 176, detail of the single penicillus

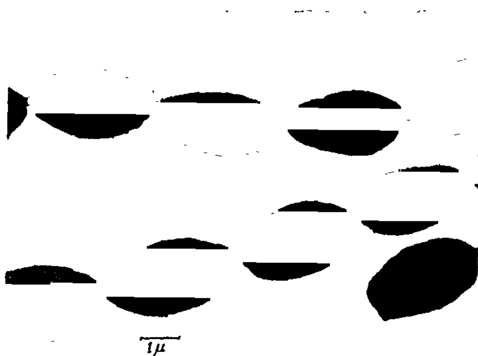


Fig. L-29. *Penicillium chrysogenum* Thom, FAT 917 conidia showing the smooth or nearly so walls and the elliptical or ovate form



Fig. M-29 A. *Penicillium chrysogenum* Thom, FAT 533, low power view of colony section showing typically velvety character of texture

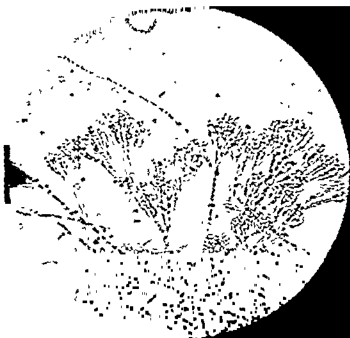


Fig. M-29 B. *Penicillium chrysogenum* Thom, FAT 533, detail of penicilli

30. *Penicillium notatum* Westling



Fig. M-30 A. *Penicillium notatum* Westlsng FAT 578, detail of a single penicillus.



Fig. M-30 B. *Penicillium notatum* Westling, FAT 1079, detail of penicilli.

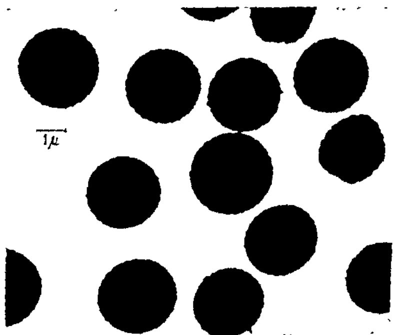


Fig. E-30. *Penicillium notatum* Westling, FAT 619, conidia showing the smooth or nearly so walls and the globose to subglobose form.

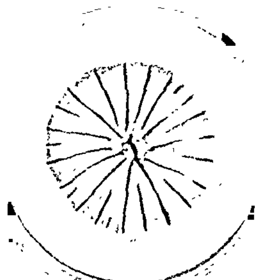


Fig. C-30. *Penicillium notatum* Westling, FAT 578, on Czapek agar, 10 days.

ツァペック寒天培養における集落の発育は 25°C にて5日目 16～30 mm，10日目 39～70mm (Fig. C-30)，20日目 58～72 mm；30°C，10日目 32-59 mm；37°C，発育不能；菌叢はビロード状又は類似状，分生胞子形成は微細構造を豊富に持つ緻密な菌叢を形成する基礎交錯菌糸帯を有し，通常顕著な車輪様の放射状皺を有す，分生胞子着生は著しく，集落周縁部は白又は黄色，1～2 mm 巾，又或る菌株にては分生胞子着生余り多くなく，中心部が黄色調；分生胞子着生部は青緑又は黄緑色調，順次くすんだ或はオリーブ緑色調を呈す；滲出物は僅小又は豊富，屢々1～3 mm の直径大の水滴となり，クリーム黄色又は淡褐色調，集落裏面は鮮或は淡黄色に全面呈色又時に中心部淡褐色調，集落周辺寒天は著しい鮮又は淡黄色調；分生胞子柄は基質又は基礎交錯菌糸帯より直立し，長さは変化に富み 120～220 μ～500 μ×2.5～3.7 μ～6.8 μ，頂端部が幾分膨大し 2.8～4.3 μ～7.5 μ，滑面，ペニシラスは不整斉輪生状で，梗子の群生を持った基底梗子の一群生状を示すか，一段又は数段の分枝を有す (Fig. M-30)，分生胞子連鎖は円柱状，又は錯状 長さ 60～130 μ，分枝はサイズ不均一で，6.3～31 μ×2.5～4.3 μ，基底梗子は通常 2～6 ケ群生，緻密又は不明確な緻密状に着生，6.2～15.6×2.1～4.3 μ；梗子は一般的に緻密に 3～8 ケ着生，7.5～10.6 μ×1.8～3.3 μ，分生胞子は球形又は亜球形，2.1～3.2 μ 又は 3.7 μ，滑面，又電子顕微鏡写真 (Fig. E-30) にては僅小な粗面．

ステイープ寒天培養にては幾分かツァペック寒天より集落の発育大，25°C にて5日目 20～40 mm，10日目 48～70 mm，20日目 64～78 mm，30°C 10日目，41～65 mm，37°C 発育不能，菌叢はビロード状，豊富な分生胞子着生を示し，通常ツァペック寒天培養より僅かに濃暗色調，著しい放射状皺を有し；滲出物は豊富，集落裏面，周辺寒天はツァペックより濃色調，他の諸性質は同じ．

亜硝酸寒天培養にては特長的に発育不能．

本菌の分布は広く，土壌，腐敗物より数多く分離される．

30. *Penicillium notatum* Westling

Colonies on Czapek agar growing fairly rapidly in most strains, attaining a diameter of 39 to 70 mm. in 10 to 12 days at 25°C (Fig. C-30), 32 to 59 mm. at 30°C; seldom growing at 37°C; (growing little or not on NO_2-medium); velvety or velutinous, consisting of a fairly close-textured basal felt bearing abundant conidial structures, commonly azonate, usually showing conspicuous radial furrows to produce a whee-like appearance, heavily sporing throughout except for a white to yellowish growing margin 1 to 2.0 mm wide in most strains, in others rather light-sporing and yellowish in colony centers, conidial areas in blue-green or typical yellow-green shades near Hays Green, Winter Green, Dark Russian Green, Dark Yellowish Green, Bluish Gray Green, becoming darker similar shades or dull or olivish shades; exudate limited or abundant, often collecting in large drops 1 to 3 mm in diameter, clear yellow to light brownish shades; odor not pronounced, reverse bright or pale yellow shades throughout and sometimes pale brownish shades in central areas, with surrounding agar strongly bright or pale yellow shades; conidiophores arising primarily from the substratum or basal felt, variable in length, 120 to 220 μ or 500 μ by 2.5 to 3.7 μ or 6.8 μ, with apices somewhat enlarged up to 2.8 to 4.3 μ or 7.5 μ, with smooth or nearly so walled, penicilli asymmetrical and biverticillate, sometimes showing one or more fertile branches but commonly consisting of a simple terminal verticil of metulae bearing clusters of sterigmata, (Fig. M-30), and conidial chains up to 60 to 130 μ or 260 μ in length, column or loosely tangled, branches variable in size, mostly 6.3 to 31 μ by 2.5 to 4.3 μ, metulae usually in groups of 2 to 6, variable in length, compact or loosely compact, ranging from 6.2 to 15.6 μ by 2.1 to 4.3 μ, sterigmata commonly borne in verticils of 3 to 8, compact, mostly 7.5 to 10.6 μ by 1.8 to 3.3 μ; conidia globose to subglobose, mostly 2.1 to 3.2 μ or 3.7 μ in diameter, with smooth or nearly so, and the slightly rough walls are shown by electron microscopy (Fig. E-30).

Colonies on steep agar somewhat more rapidly, 48 to 70 mm in 10 to 12 days at 25°C, 41 to 65 mm 30 C, seldom growing at 37°C; strictly velvety, sporng throughout, usually in slightly darker shades, conspicuously furrowed in a radial pattern; exudate abundantly produced, reverse and agar in duller shades than on Czapek, the other characters as on Czapek.

Strains of this species occurs from soils and deteriorating materials in nature. And the species widely distributed in nature.

*Westling R., Arkiv för Botanik 11 55, 95-97, figs 17, 59 1911

**Biourge, Ph., Monograph, La Cellule 33 fasc 1, pp 179-181, Col Pl IV abd Pl VIII fig 37 1923

***Thom, C The Penicillia pp. 264 265, 1930

****Raper, K B., Thom, C and Fennell, D I., Op cit., pp 367-371

*****Abe, S., Op cit 94-95 1956

31. *Penicillium oxalicum* Currie and Thom



Fig. M-31 A. *Penicillium oxalicum* Currie and Thom, FAT 265, detail of penicilli.



Fig. M-31 B. *Penicillium oxalicum* Currie and Thom, FAT 265, detail of penicilli

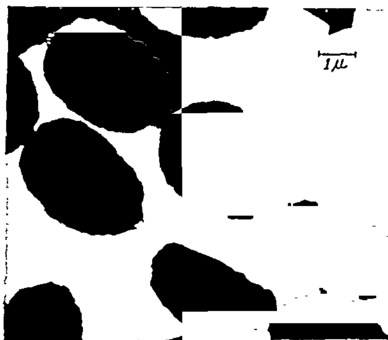


Fig. E-31. *Penicillium oxalicum* Currie and Thom, FAT 11[illegible], conidia showing the slightly rough walls and the elliptical form

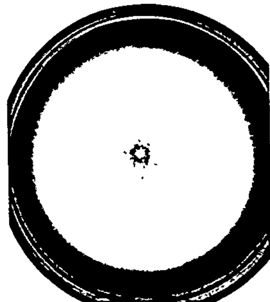


Fig C-31. *Penicillium oxalicum* Currie and Thom, FAT 524, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は25°Cにて5日目20~45 mm, 10日目, 61~83 mm (Fig C-31), 20日目76~85 mm; 30°C, 10日目, 71~80 mm, 37°C, 10日目6~65 mm; 多くの菌株にては平面的又は平滑, 或る菌株にては不規則な皺があり, 菌叢はビロード状又は類似様, 分生胞子の着生は著しく多く, 培養器に少し衝動を与えても成熟後には特徴的に分生胞子塊が壊れ落ちる, 集落周辺部は白, 淡黄色或は時に橙桃色, 10~20 mm 巾; 分生胞子着生部は暗濃黄緑色或はオリーブ緑色調, 順次濃オリーブ緑色又は黒オリーブ色調を呈す, 滲出物は欠又は豊富, 無色, 集落裏面は全面黄色調或は緑, 黄, 橙色調を部分的に呈色, 集落周辺寒天は無色, 順次淡黄色に変色, ペニシラスは不整斉輪生状 (Fig M-31); 分生胞子柄は基底部に直立し, 80~200~380 μ×32~47 μ, 頂端部は幾分か膨大し35~62 μ, 滑面, 分枝は欠, 又は単立し, 13~24 μ×30~45 μ, 基底梗子と同レベルに屢々着生す, 基底梗子は通常2~4ケ並行状様に着生, 13~25 μ×29~41 μ, 頂端部は30~53 μ, 梗子は並行状様に4~8ケ群生し, 91~156 μ×23~40 μ, 頂端部は多少細い, 分生胞子は楕円形, 34~54×25~40 μ, 滑面, 又電子顕微鏡写真 (Fig E-31) にては01 μ 以下の僅小な粗面, 分生胞子連鎖は円柱状, 長さ60~300~400 μ

スティープ寒天培養にての集落の発育は25°Cにて5日目26~55 mm 10日目75~83 mm, 20日目80~85 mm, ツァペック寒天培養よりも一層分生胞子の着生多く且成熟後の分生胞子層は地殻の如く容易に剥れ易い, 他の諸特性は同じ

亜硝酸ソーダ寒天培養にてはツァペック寒天同様, 発育良好

本菌種は土壌, 葉, 病稲米, 病変果物類等より屢々分離さる

31. *Penicillium oxalicum* Currie and Thom

Colonies on Czapek agar broadly spreading, attaining a diameter of 61 to 83 mm in 10 to 12 days at 25 C (Fig. C-31); 71 to 80 mm at 30 C; 6 to 65 mm. at 37 C; (growing very well on NO_2 medium); generally plane or smooth but in some strains irregularly furrowed strictly velvety or velutinous, heavily sporing with conidia forming a deep layer which, when mature, characteristically falls away en masse if the culture vessel is tapped, with white, pale yellow or sometimes orange pink margin 1.0 to 2.0 mm wide, shading darkish yellow green or olive green shades near Dusky Olive Green, Dull Blackish Green, Dusky Yellowish Green, becoming Dusky Olive Green or Dark Ivy Green; exudate lacking or abundant ly, colorless; no odor; colony reverse generally in yellowish shades throughout or greenish, yellow, orange shades localized, with surrounding agar colorless, becoming pale yellow shades pigmented; penicilli typically biverticillate and asymmetric (Fig. M-31); conidiophores arising from the substratum in a close stand to produce a velvety colony surface, mostly 80 to 200 μ or 300 μ by 32 to 47 μ, with apices somewhat enlarged up to 35 to 62 μ in diam. [illegible]

[illegible] usually in groups of 2 to 4, loosely parallel, [illegible] 25 μ by 29 to 41 μ, with apices 30 to 53 μ [illegible] mata borne in terminal clusters of 4 to 8, loosely parallel, mostly 91 to 156 μ by 23 to 40 μ with conidium bearing tips more or less tapered [illegible] dia typically elliptical, ranging from 34 to 54 μ by 25 to 40 μ, with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig. E-31); conidial chains column, up to 60 to 300 or 400 μ in length

Colonies on steep agar grow more broadly than on Czapek, 78 to 85 mm in 10 to 12 days at 25 C; 75 to 83 mm at 30 C; [illegible] mm at 37 C, generally heavier sporing than upon Czapek agar, producing heavy layers of conidia which break off readily as crusts when mature; the other characters as on Czapek

Strains of this species occurs from [illegible] leafs, disease rice, disease fruits, etc

*Currie, J M and Thom, C, Jour [illegible] 239, fig 1 1915

**Thom, C, Op cit, pp 247 247, fig 31 [illegible]

***Raper, K B, Thom C and Fennell [illegible] pp 378 391 1949

Abe, S, J Gen Appl Microbiol [illegible]

32. *Penicillium digitatum* Saccardo



Fig. M-32. *Penicillium digitatum* Saccard, FAT 1331, detail of penicilli.

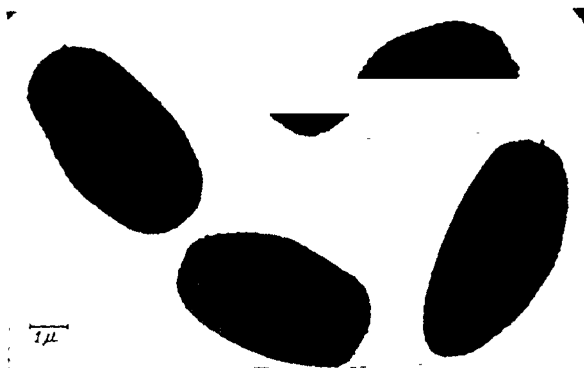


Fig. L-32. *Penicillium digitatum* Saccardo, FAT 1331, conidia showing the slightly rough walls and the cylindrical or elliptical form.

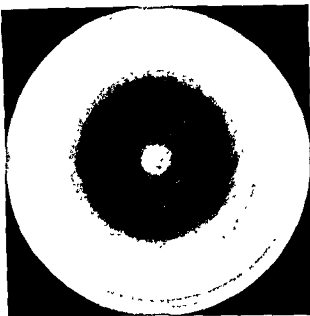


Fig. C-32 *Penicillium digitatum* Saccardo, FAT 1331, on steep agar, 10 days

ツァペック寒天培養に於ける集落の発育は特異的に不良にて平面的で且つ分生胞子の着生部僅小にて粗雑なる集落を形成す，25°C, 5日目約10日目約30 mm; 20日目約 35 mm，30°C, 10日目約 25 mm，37°C, 発育不良，集落円周部無胞子着生部は巾広く，約10～15 mm巾；菌叢ビロード状，分生胞子着生部はくすんだ黄緑色，集落裏面は無色，順次薄暗オリーブ色を呈し；集落周辺寒天は無色；他の諸性質は下記の如し。

スティープ寒天培養に於ける集落の発育は良好にて，25°C 5日目約 35 mm，10日目約 65mm，(Fig C-32)，20日目約 75 mm，30°C 10日目約 60 mm; 37°C 発育不能，菌叢ビロード状，平面，平滑，基礎菌糸帯の発育良好，集落円周部は白色，約 1 0～2 0 mm巾，分生胞子着生部はくすんだ黄緑色調，順次灰オリーブ色又は薄暗オリーブ色を呈す，滲出物は欠，集落裏面は無色又は薄いか又はくすんだ褐色或はオリーブ色調；集落周辺寒天は無色；ペニシラスは不整斉輪生状，構造は雑多で且サイズは変化に富む (Fig M-31)，分生胞子柄は基底菌糸或は基礎交錯菌糸帯より直立し，60～200 μ×4 0～5 5 μ，頂端部幾分か膨大し，4 2～6 1 μ巾，滑面，分枝は変化に富み，15～28 μ×2 4～5 7 μ，基底梗子は形，サイズ変化に富み，15～31 μ×2 5～5 6 μ，多少散開状に 3～5ヶ着生，頂端部 3 0～6 0 μ，梗子は均等で変化に富み，15～29 μ×2 5～4 5 μ，幾分か散開状に 3～5ヶ群生す；分生胞子は長楕円形又は楕円形，3 7～9 4 μ×2.5～4 4 μ，度々一層大型現れ，滑面　又電子顕微鏡写真 (Fig E 32) にては 0 1 μ 以下の僅小な粗面，分生胞子連鎖は並行状様長さ10～300 μ.

亜硝酸加寒天培養にては多少発育を示す。

本菌種は腐敗果物特にレモン，オレンヂ，蜜柑類より分離さる

32. *Penicillium digitatum* Saccardo

Colonies on Czapek agar growing rather restrictedly, attaining a diameter about 30 mm in 10 to 12 days at 25 C; (growing fairly well on NO_2-medium), plane and sparsely colonies produced, with white sterile margin, broadly, about 10 to 15 mm. wide, velvety, conidial areas in dull yellow green shades near Vetiver Green; reverse colorless, becoming dark olive buff, with surrounding agar colorless, the other characters see steep agar below.

Colonies on steep agar growing luxuriantly spreading, attaining a diameter of about 65 mm in 10 to 12 days at 25°C, (Fig C-32) about 60 mm at 30°C; seldom growing at 37°C; velvety, plane or smooth, consisting of a well-developed vegetative mycelium at the agar surface upon which are borne aboundant conidial structures, with a white margin about 1 0 to 2 0 mm wide, sporulating areas in dull yellow-green shades near Vetiver Green, becoming grayish olive or Dark Olive Buff; no exudate produced; odor pronounced, strongly aromatic, suggestive of decaying citrus fruits; reverse uncolor or showing light to dull drown or Dark Olive Bufi, with surrounding agar colorless; penicilli asymmetrical and biverticillate but varying greatly in dimensions and complexity (Fig M 32), conidiophores arising from submarged hyphae, or from the basal mycelial felt, commonly ranging from 60 to 200 μ by 4 0 to 5 5 μ, with apices somewhat enlarged up to 4 2 to 6 1 μ in diameter, with smooth or nearly so walled, branches variable, mostly 15 to 28 μ by 2 4 to 5 7 μ; metulae variable in form and dimensions, commonly ranging from 15 to 31 μ by 2 5 to 5 6 μ, more or less divergent, 3 to 5 in verticils, with apices 3 0 to 6 0 μ, sterigmata equally variable and ranging from 15 to 29 μ by 2 5 to 4 5 μ, somewhat divergent, 3 to 5 in verticils, conidia cylindrical or elliptical, mostly 3 7 to 9 4 μ by 2 5 to 4 4 μ, occasionally more larger, with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E 32), conidia chains loosely parallel, up to 10 to 300 μ in length

Strains of this species isolated from spoiling citrus fruits, lemon and oranges

*Saccardo D, Mycotheca Italica as No, 986, Herbarium U S Dept Agr Sylloge Funogrum, Vol IV 78

**Thom, C U S Dept Agr Bur Anim Ind Bull 118, pp 31 33, fig 3 1910, and The Penicillia pp 242 245, fig, 29 and 30 1930

***Raper, K B, Thom, C and Fennell, D I, Op Cit, pp 386 390 1949

****Abe, S J Gen Appl Microbiology p 97 1956.

33. *Penicillium roqueforti* Thom

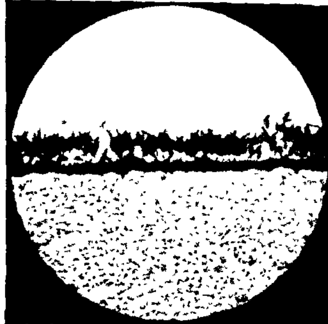


Fig. M-33 A. *Penicillium roqueforti* Thom, FAT 731, low power view of colony section showing typically velvety character of texture.



Fig. M-33 B. *Penicillium roqueforti* Thom, FAT 513, low power view of colony section showing long conidiophores directly arised from substratum.

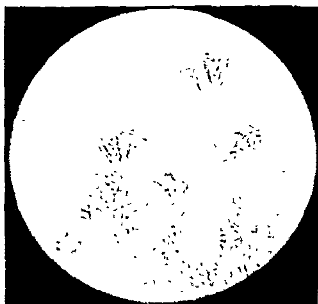


Fig. M-33 C. *Penicillium roqueforti* Thom, FAT 731, detail of penicilli.

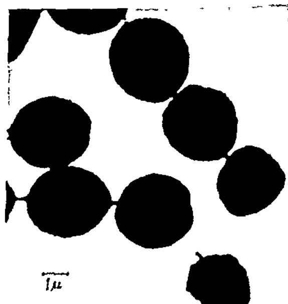


Fig. L-33. *Penicillium roqueforti* Thom, FAT 1138 conidia showing the slightly rough walls and the globose or subglobose form

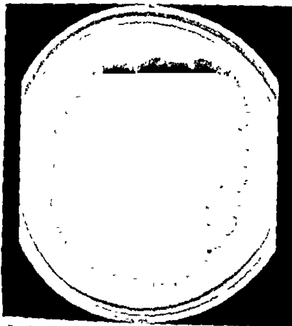


Fig. C-33 *Penicillium roqueforti* Thom, FAT 543, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は25°Cにて5日目18～46 mm，10日目46～76 mm，(Fig C-33)，20日目59～80 mm；30°C，10日目32～67 mm；37°C，発育不能、分生胞子の着生豊富、菌叢はビロード状，又は類似状，平滑、又は平面的に発育或る菌株にてはかるい放射状皺があり，集落円周部は白色，10～30 mm 巾，又或る菌株にては蜘網状を呈す，分生胞子着生部は黄緑又は青緑色調で，順次くすんだ緑色，暗オリーブ，オリーブ褐色を呈す；滲出物は欠又は豊富，無色；集落裏面は無色又は緑色，桃或は褐黒色調，集落周辺寒天は常に無色，ペニシラスは変化に富み，不整斉輪生状 (Fig M 33)；分生胞子柄は変化に富み，長又は短く，60～120 μ，又は 700 μ×3 6～5 6 μ 頂端部は幾分か肱大 3 9～7 5 μ，大粒又は顆粒状粗面，分枝は12 5～31 μ×3 1～4 8 μ，同上粗面；基底梗子やゝ粗密又は幾分か散開状に 2～6ヶ群生，8 4～16 μ×2 4～4 4 μ，顆粒状，又は斑点状粗面，頂端部3 0～5 6 μ，梗子は幾分か緻密に 3～7ヶ着生し，9 0～12 5 μ×2 1～3 5 μ；分生胞子球形又は亜球形，2 8～5 0 μ，滑面，又電子顕微鏡写真 (Fig E-33) にては0 1 μ 以下の僅小な粗面；分生胞子連鎖は似円柱状又は錯状，長さ60～120 μ 又は 200 μ

スティープ寒天培養に於ける集落の発育はツァペック寒天培養よりも少しく早いか又は遅い；25°Cにて5日目25～48 mm，10日目，40～81 mm，20日目60～88 mm，30°C 10日目，30～68 mm；37°C，発育不能；平面又は平滑又は放射状の皺を有し，或る菌株にては不規則；他の諸特性は同上。

亜硝酸塩寒天培養においてはツァペック寒天培養同様良好なる発育を示す。

本菌種はロックエフォールチーズ，土壌，タバコ，不良錠剤等より分離される。

33. *Penicillium roquef*...

Colonies on Czapek ... or broadly spreading ... to 76 mm in 10 to ... 32 to 67 mm at 30 C ... (growing very well ... ing, velvety or velutin... some strains slightly ... white margin 10 to ... appearing arachnoid ... green or blue green ... Dark Yellowish Green ... becoming to bull ... Deep Olive, Olive B... lacking or abundant ... or pronounced, slightly ... in shades of colorless or ... ous shades surrounding ag... penicilli variable in pattern, a... biverticillatate (Fig M-33), conidiopho... ble, short or long, mostly 60 to 120 or 700 μ by ... to 5 6 μ, with apices somewhat enlarged up to 3 9 to 7 5 μ in diameter, with protuberculate or granular walled, branches variable, 12 5 to 31 μ by 3 1 to 4 8 μ with walls similar above, metulae loosely compact, or somewhat divergent, 2 to 6 in verticils, mostly 8 4 to 16 μ by 2 4 to 4 4 μ, with walls granular or punctate, with apices 3 0 to 5 6 μ, sterigmata loosely compact, 3 to 7 in verticils, mostly 9 0 to 12 5 μ by 2 1 to 3 5 μ, conidia globose or subglobose, commonly ranging from 2 8 to 5 0 μ, smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig F-33), conidial chains loosely column or tangled, up to 60 to 120 μ or 200 μ in length

Colonies on steep agar growing more rapidly or slowly than on Czapek, 40 to 81 mm in 10 to 12 days at 25°C; 30 to 68 mm. at 30°C, seldom growing at 37°C, plane or smooth, typical radial furrowed or some strains irregular, the other characters as on Czapek

Strains of this species isolated from Roqueforti cheese, soils, tobacco and spoiling tablets

*Thom, C , U. S Dept Agr Bur Anim Ind , Bull 82, pp 35-36, fig 2 1906 , also ibid , 118, p 34, 1910 , The Penicillia, pp 277 279, fig 38 1930

**Raper, K B , Thom, C and Fennell, D I , Op cit pp 395-401 1949.

***Abe, S , J Gen Appl Microbiology 98 99 1956

34. *Penicillium casei* Staub



Fig. M-34. *Penicillium casei* Staub. FAT 817, detail of penicilli



Fig. E-34. *Penicillium casei* Staub, FAT 1232, conidia showing the slightly rough walls and the elliptical to subglobose form



Fig C-34. *Penicillium casei* Staub, FAT 817, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は25°C にて5日目 20~23 mm, 10日目40~66 mm (Fig C-34), 20日目45~68 mm; 30°C 10日目24~53 mm, 37°C 2~13 mm, 菌叢ビロード状, 又は類似, 放射状皺を有し, 分生胞子の着生多く, 集落円周部は白色, 0 5~1 5 mm 巾; 分生胞子着生部は明るい又はくすんだ黄緑色調; 滲出物は僅小又は豊富, 無色又は淡黄色調; 集落裏面は黄, 橙, 褐色調, 集落周辺寒天は桃, 褐色調着色; 分生胞子柄は硬く交織, 又は交錯基礎菌糸帯より稠密に直立し, 多くは 90~200μ 又は 380μ ×3 2~5 6μ, 頂端部は幾分か膨大, 4 0~7 5μ, 大約, 又は顆粒状粗面; ペニシラスは不整斉輪生状, 梗子を持った基底梗子が群生している分枝は一段或は数段に分岐し (Fig M 34), 分生胞子連鎖は円柱状様或は縺状, 長さ 60~250μ~380μ, 分枝はサイズ変化に富み, 9 3~15 6μ×4 4~6 0μ, 屡々分岐す, 基底梗子は稠密様に 2~5 ヶ群生し, 8 1~12 5μ×2.8~4 4μ 斑点又は顆粒状粗面; 梗子 3~5 ヶ稠密様に着生, 6 8~9 3μ ×2 0~3 0; 分生胞子は楕円又は亜球形, 3 1~3 9μ× 2.3~3 1μ, 滑面, 又電子顕微鏡写真 (Fig E 34)にては 0 1μ 以下の僅小なる粗面。

スターブ氏人培養に於ける集落の発育は 25 C にて 5日目 23~27 mm, 10日目 43~70 mm, 20日目 65~72 mm, 30°C 10日目 30~54 mm, 37°C 2~10 mm, 目の細い且著しい放射状の皺を有し, 分生胞子の着生著しく, 鮮黄緑色調, 順次濃オリーブ緑色調を呈す, 他の諸性質は同上。

亜硝酸塩入培地にては発育不能

本菌株は土壌又はチーズより分離さる。

34 *Penicillium casei* Staub

Colonies on Czapek agar growing rather rapidly, 40 to 66 mm. in 10 to 12 days at 25°C (Fig C-34), 24 to 53 mm. at 30 C; 2 to 13 mm at 37°C, (growing little or not on NO_2-medium), velvety or velutinous, typically radial furrowed, heavily sporing, growing marginal zone 0 5 to 1 5 mm wide, white, shading into fairly bright or dull yellow-green shades near Dark Dull Yellow Green, Danube Green, becoming Yew Green or Leaf Green; exudate limited or abundantly, colorless or light yellow shades, odor very faint or lacking; reverse in yellow to orange, brownish shades, with surrounding agar pinkish or brownish shades pigmented, conidiophores borne in a dense stand, arising mainly from a closely interwoven and tough basal mycelial felt, mostly 90 to 200μ or 380μ by 3 2 to 5 6μ, with apices somewhat enlarged up to 4 0 to 7 5μ, with protuberances or granular walled; penicilli asymmetric and biverticillate, typically consisting of one or more branches in addition to the main stem, each terminating in a cluster of metulae bearing sterigmata (Fig M-34) and spore chains loosely column or tangled, up to 60 to 250μ or 380μ in length, branches variable in size, mostly 9 3 to 15 6 μ by 4 4 to 6 0 μ, occasionally rebranched, metulae borne in groups of 2 to 5, loosely compact, mostly 8 1 to 12 5μ by 2 8 to 4 4μ, with punctate or granular walled, sterigmata borne in groups of 3 to 5, loosely compact mostly 6 8 to 9.3μ by 2 0 to 3 0μ, conidia elliptical to subglobose, mostly 3 1 to 3 9μ by 2 3 to 3 1μ, with smooth or nearly so, and the slightly rough walls are shown by electron microscopy (Fig E 34).

Colonies on steep agar growing more rapidly, attaining a diameter of 43 to 70 mm in 10 to 12 days at 25 C, 30 to 54 mm. at 30°C, 2 to 10 mm at 37°C; closely and conspicuously furrowed in a radial pattern, heavily sporing, conidial areas bright yellow shades near Empire Green shades, becoming Dusky Olive Green, the other characters as on Czapek

Strains of this species isolated from soils and cheeses

*Staub, W , Centbl f Bakt etc II 31 454-466, 1911

**Thom, C , Op cit , p 270 1930

***Raper, K B , Thom, C and Fennell D I , Op cit , pp 401-402 1949

****Abe, S , J Gen Appl Microbiology 100 101 1956

35. *Penicillium pseudo-casei* Abe

36. *Penicillium brevi-compactum* Dierckx



Fig. M-36. *Penicillium brevi-compactum* Dierckx, FAT 1285, detail of a single penicillus.

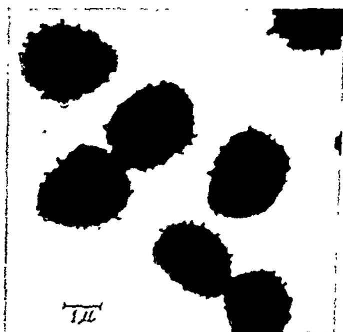


Fig. E-36. *Penicillium brevi-compactum* Dierckx, FAT 12[illegible], conidia showing the delicately echinulate or verrucose walls and the globose to subglobose form

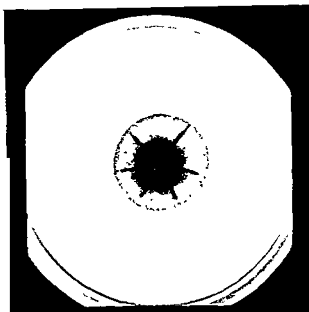


Fig. C-36. *Penicillium brevi compactum* Dierckx, FAT 1285 on Czapek agar, 10 days.

ツァペック寒天培養に於ける集落の発育は25°Cにて5日目約8mm；10日目約29mm（Fig C-36），20日目約40mm；30°C 10日目約32mm，37°C，発育不能；菌叢はビロード状，高さ0.8～1.0mm，屡々中心部隆起，又時々放射状の皺を有す．分生胞子着生部はくすんだ黄緑色調〜暗灰緑色調を呈す，滲出物は僅小，黄又は橙褐色調，集落裏面は淡又はくすんだ黄色調，集落周辺寒天は淡黄色に着色；ペニシラスは緻密に不規則に分枝している1，2，又は以上の分枝を有し，夫々梗子，基底梗子の群生を有す；分生胞子連鎖は並行様，長さ60～120μ，分生胞子柄は直立し，多少硬い，250～600μ×3.7～5.0μ，頂端部多少膨大4.6～6.2μ，少し粗面，分枝6.2～17.6×3.1～5.6μ，基底梗子は3～4ヶ緻密に着生，楔形に頂端部に向い膨大，5.0～9.4μ×3.1～4.6μ，頂端部3.7～6.2μ，梗子は緻密に又多少膨れ型に4～6ヶ群生，7.5～10μ×2.1～3.0μ 分生胞子球形又は亜球形，2.1～3.4μ，滑面，電子顕微鏡写真（Fig E 36）にても幾分か疣刺状又は粉状粗面。

スティープ寒天培養に於ける集落の発育は25°Cにて5日目約12mm，10日目約28mm，20日目約35mm，30°C 10日目約25mm，37°C 発育不能，他の諸性は同じ。

亜硝酸寒天培養にては多少発育を示す。

本菌株は土壌より分離さる。

36 *Penicillium brevi-compactum* Dierckx

Colonies on Czapek agar growing restrictedly, attaining a diameter of about 29 mm in 10 to 12 days at 25°C (Fig C-36); about 32 mm at 30°C; seldom growing at 37°C; (growing fairly well on NO_2-medium); velvety, about 0.8 to 1 mm deep, often raised in central colony area, sometimes radially furrowed, with a white margin about 1.0 mm. wide, conidial areas in dull yellow-green shades near Tea Green or Sage Green, becoming Leaf Green or Andover Green, exudate limitedly, yellow to deep orange-brown in color; odor slight, not distinctive; reverse in pale or dull yellow shades, with surrounding agar pale yellow shades pigmented; penicilli compact irregularly branched with 1, 2, or more branches closely appressed, bearing crowded clusters of metulae and sterigmata (Fig M 36) and loosely parallel conidial chains, up to 60 to 120 μ in length; conidiophores erect, usually straight and appearing more or less rigid, mostly 250 to 600 μ by 3.7 to 5.0 μ, with apices somewhat enlarged up to 4.6 to 6.2 μ, with delicately roughened walled, branches mostly 6.2 to 17.6 μ by 3.1 to 5.6 μ, metulae in groups of 3 to 4, enlarging upward, commonly wedge-shaped, measuring 5.0 to 9.4 μ in length by 3.1 to 4.6 μ in diameter, commolv inflated measuring up to 3.7 to 6.2 μ, in diameter; sterigmata in groups of 4 to 6, compact or more or less inflated, usually 7.5 to 10 μ by 2.1 to 3.0 μ, conidia globose to subglobose, variable, ranging from 2.1 to 3.4 μ, with walls smooth or nearly so, and the delicately echinulate or verruculose walls are shown by electron microscopy (Fig E-36)

Colonies on steep agar restrictedly, about 28 mm in 10 to 12 days at 25°C, about 25 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species isolated from soils

*Dierckx, R P, Soc Scien, Brux 25 89 1901
**Biourge, PH, Monogr, La Cellule 33 fasc 1 pp 155 157, Col Pl II and Pl III, fig 16 1923
***Thom C, The Penicillia, pp 295 296 1930
****Raper, K B, Thom C and Fennell D I Op cit pp 407-411 1949
*****Abe, S, J Appl Gen Microbiology 103 1956

37. *Penicillium stoloniferum* Thom



Fig. M-37A. Low power view of colony section showing typically velvety character of texture.



Fig. M-37B. Low power view of colony section showing loosely parallel or divergent conidial chains



Fig. M-37C. Detail of a single penicillus

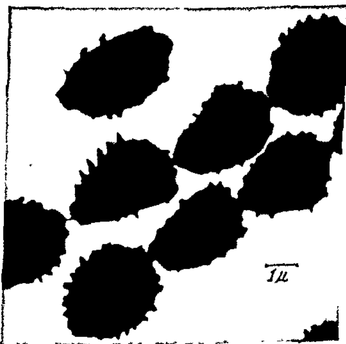


Fig. E-37 *Penicillium stoloniferum* Thom, FAT 415, conidia showing the echinulate or verruculose walls and the elliptical to subglobose form



Fig C-37 *Penicillium stoloniferum* Thom, FAT 815, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C にて5日目 13～39 mm，10日目 35～54 mm (Fig C-37)，20日目53～68 mm，30°C，10日目 28～48 mm；37°C 発育不能，多くの菌株にては中心部が著しく隆起し，明瞭な放射状皺を有し，又他の菌株は平滑，集落周辺円周は滑，又は凸凹あり，菌叢ビロード状，集落全面に微細構造を作り，一般に集落円周部，中間部に豊富，分生胞子着生部は黄緑色調，順次くすんだ黄緑，オリーブ緑，又は灰緑色調を呈す，滲出物は欠或は僅小，薄黄或は褐色調；集落裏面はくすんだ黄色，又は薄オリーブ色調，集落周辺寒天は無色又は薄黄色調，ペニシラスは恰も短い，緻密なブラシの如く短く且各微細構造が近接緻密に構成 (Fig M 37)，分生胞子は並行状又は少し散開状，長さ 60～120 μ，分生胞子柄は基質より直立し，120～380 μ×3.0～5.1 μ，頂端部幾分か膨大 3.9～6.3 μ，滑面又は僅かに斑点状粗面，分枝は 9.5～25 μ×3.0～4.7 μ，基底梗子は緻密に 3～6 ケ群生し，8.1～22 μ×2.8～4.7 μ，頂端部 3.1～6.2 μ，梗子は 3～8 緻密に群生，比較的短く，8.3～12.5 μ×2.1～3.3 μ，分生胞子は楕円又は亜球形，2.5～4.2 μ×2.1～3.4 μ，小刺状又は疣状粗面，又電子顕微鏡写真 (Fig E-37) にても同様，粗面

スティープ寒天培養に於ける集落の発育は 25°C にて5日目 17～40 mm，10日目，33～48 mm，20日目 45～72 mm，30°C 10日目 23～40 mm，37°C，発育不能，他の諸特性は同上

亜硝酸寒天培養に於ける集落の発育はツァペック寒天同様良好

本菌株は土壌，又は腐敗物より屡々分離される

37. *Penicillium stoloniferum* Thom

Colonies on Czapek agar growing rather rapidly, attaining a diameter of 35 to 54 mm in 10 to 12 days at 25°C (Fig C-37); 28 to 48 mm at 30°C; seldom growing at 37°C; (growing very well on NO_2-medium); strongly wrinkled or radial furrowed in most strains, with central areas often conspicuously raised, and the others smooth, and colonies circumference smooth or rugged, velvety or nearly so; conidial structures abundantly produced throughout the whole colony but generally in greater abundance in marginal to submarginal areas, typically in Yellow-green shades approximately Deep Dull Yellow Green or Empire Green, Leaf Green, Pea Green, becoming similar shades or Vetiver Green, Citrine Drab, Deep Olive, exudate lacking or limitedly, pale yellow or brownish shades, odor neither pronounced nor distinctive, reverse dull yellow or pale olive colors, with surrounding agar colorless or pale yellow shades pigmented, penicilli typically short and compact with constituent elements closely appressed, bearing parallel or slightly divergent chains of conidia (Fig M 37) up to 60 to 120 μ in length, and withal presenting the picture of a short, compact brush, conidiophores arising from the substratum, up to 120 to 380 μ by 3.0 to 5.1 μ, with apices somewhat enlarged up to 3.9 to 6.3 μ in diameter, with smooth or slightly punctate walled, branches usually 9.5 to 25 μ by 3.0 to 4.7 μ, metulae compact, ranging from 3 to 6 in number and varying from 8.1 to 22 μ by 2.8 to 4.7 μ, with apices 3.1 to 6.2 μ, sterigmata borne in compact cluster of 3 to 8, comparatively short, generally measuring 8.3 to 12.5 μ by 2.1 to 3.3 μ, conidia elliptical or subglobose, mostly 2.5 to 4.2 μ by 2.1 to 3.4 μ, typically echinulate or verruculose walled, and the echinulate or verruculose walls are shown by electron microscopy (Fig E-37)

Colonies upon steep agar attaining a diameter of 33 to 48 mm in 10 to 12 days at 25 C, 23 to 40 mm at 30 C, seldom growing at 37 C, the other characters similar as on Czapek

Strains of this species isolated from soils and deteriorating materials

*Thom C U S Dept Agr Bur Anim Ind Bull 118, 68 69 fig 26 1910, The Penicillia 292 294 figs 41 and 42 1930

**Raper, K B, Thom, C and Fennell D I pp 412 414 1949

***Abe S J Gen Appl Microbiology 103 104 1956

38. *Penicillium ochraceum* Thom



Fig. M-38. *Penicillium ochraceum* Thom, FAT 766, detail of penicilli

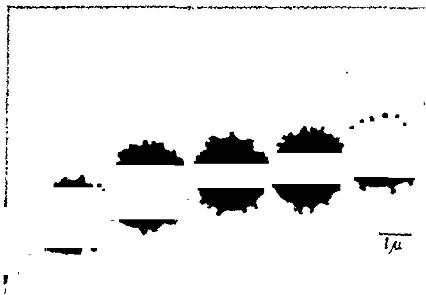


Fig. E-38. *Penicillium ochraceum* Thom FAT 766, conidia showing the delicately verruculose or echinulate walls and the globose to subglobose form

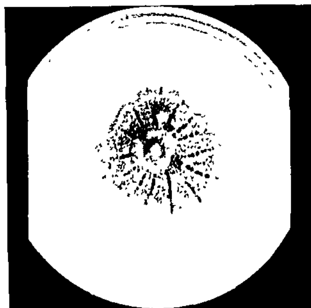


Fig. C-38. *Penicillium ochraceum* Thom, FAT 766, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は25°Cにて5日目約15mm，10日目約45mm (Fig C-38)，20日目約70mm；30°C 10日目約40mm；37°C発育不能，菌叢束状又はビロード状様，放射状の皺を有し，順次輪生状に発育，集落円周部は白色又は少し黄色，約2.5mm 幅；分生胞子着生部は黄オリーブ色調，順次暗緑オリーブ色調を呈す；滲出物豊富，無色又は淡桃色調；集落裏面はくすんだ黄色又は淡桃紫色調，集落周辺寒天は無色；分生胞子柄は豊富で，基底菌糸又は気菌糸より生育，120～300μ×3.0～4.3μ，頂端部幾分か膨大，3.5～4.5μ，斑点状粗面；ペニシラスは不整斉輪生状，常に基底梗子，梗子の群生を持った分枝は一段又は数段に分岐を示す (Fig M-38)．又時に基底梗子，と梗子のみの場合もあり；分枝は変化に富み，12～23μ×2.8～3.8μ粗面，基底梗子，緩密状様に4～6ヶ群生，9.5～12μ×2.0～2.7μ，粗面，梗子は緩密状様に4～6ヶ着生，7.6～9.6μ×1.8～2.6；分生胞子球形又は亜球形，2.5～3.8μ，僅かに小刺状粗面，又電子顕微鏡写真 (Fig E-38) にても幾分か粉状又は刺状粗面；分生胞子連鎖は縺状又は並行状様，長さ30～120μ

スティーブ寒天培養に於ける集落の発育は25°Cにて5日目約14mm，10日目約43mm，20日目約67mm，30°C 10日目約40mm，37°C発育不能，分生胞子の着生豊富，他の諸性質は同上。

亜硝酸寒天培養にては特長的に生育不能

本菌種は土壌又は腐朽を行いつつある，有機物，より分離さる。

38 ***Penicilliunm ochraceum*** Thom

Colonies on Czapek agar growing rather rapidly, attaining a diameter of about 45 mm. in 10 to 12 days at 25°C (Fig C-38); about 40 mm. at 30°C; seldom growing at 37°C, (growing little or not on NO_2-medium); fasciculate or velutinous, radiately furrowed, azonate at first but commonly becoming definitely zonate, growing margins white to dull buff in color about 2.5 mm wide, conidial areas yellowish olive shades near Dark Olive, Yellowish Citrine, becoming dark greenish olive near Dark Olive Buff; exudate generally abundantly, colorless or pale pinkish shades, odor pronounced, penetrating, earthy; reverse in dull yellow to vinaceous shades near Vinaceous Fawn, with surrounding agar colorless; conidiophores abundant, arising from submarged or from a well developed aerial felt, 120 to 300 μ by 3.0 to 4.3 μ, with apices somewhat enlarged 3.5 to 4.5 μ, with walls punctate, penicilli asymmetric and biverticillate, usually showing one or more branches terminating in verticils of metulae and sterigmata (Fig M-38), sometimes showing metulae and sterigmata only, branches and metulae punctate walled, branches variable, 12 to 23 μ by 2.8 to 3.8 μ; metulae loosely compact, 4 to 6 in verticils, mostly 9.5 to 12 μ by 2.0 to 2.7 μ; sterigmata loosely compact verticils of 4 to 6, mostly 7.6 to 9.6 μ by 1.8 to 2.6 μ; conidia globose to subglobose, mostly 2.5 to 3.8 μ, with slightly spinulose walled, and the delicately verruculose or echinulate walls are shown by electron microscopy (Fig E-38); conidial chains tangled or loosely parallel, up to 30 to 120 μ in length

Colonies on steep agar about 43 mm in 10 to 12 days at 25°C; about 40 mm at 30°C, seldom growing at 37°C; generally deeper than on Czapek, sporulating more abundantly but with color and general colony pattern as above, the other characters as on Czapek

Strains of this species isolated from soils or organic materials undergoing slow decay

*Thom, C. The Penicillia, pp 309 310 1930

**Raper, K B Thom, C and Fenrell, D I, A Manual of the Penicillia, pp 477 479 1949

***Abe, S, J Gen Appl Microbiology p 105 1956.

39. *Penicillium crustosum* Thom

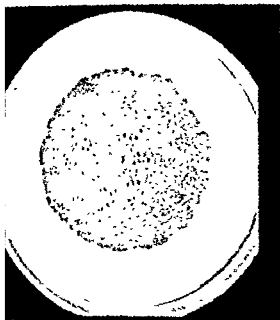


Fig. C-39. *Penicillium crustosum* Thom, FAT 735, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は25 Cにて5日目16~40 mm; 10日目49~68mm (Fig. C-39), 20日目62~70 mm; 30 C 10日目 20~50 mm, 37°C 発育不能; 菌叢束状, 平滑又は放射状溝を有し, 集落周縁部は白色, 約 0.2~2.0 mm 幅, 又分生胞子は豊富に着生し, 培養器に少しく衝撃を与えるのみにて特長的に壊れ易い分生胞子連鎖の殻を有し, 分生胞子着生部は鮮黄緑色, 又は黄緑色, 或る菌株にては青味を帯びた黄緑色調, 順次同一色調のくすんだ黄緑, 又は青緑或は, 灰オリーブ色調を呈す, 滲出物は僅少又は豊富, 無色; 集落裏面は無色或は淡黄色調, 集落周辺寒天は無色, ペニシラスは不整斉輪生状, 比較的大型 (Fig. M-39), 分生胞子柄は基質又は基礎菌糸部より発育, 60~140 μ~600 μ×3.7~6.0 μ, 頂端は 4.0~6.3 μ, 顆粒状粗面; 分枝は変化にとみ 9.3~37 μ×2.8~5.3 μ, 粗面, 基底梗子は粗密状様に 2~5 ヶ群生, 9.3~18.7 μ×2.5~4.5 μ, 顆粒状粗面, 梗子は粗密状様又は平行状に3~6ヶ叢生, 8.7~12.5×2.1~3.6 μ, 分生胞子は球形又は亜球形, 2.5~4.4 μ, 滑面, 又電子顕微鏡写真 (Fig. E-39) にても同様滑面, 分生胞子連鎖はもつれ状又は平行状様, 長さ 60~320 μ.

ステーブ寒天培養に於ける集落の発育は25 Cにて5日目 23~50 mm, 10日目 38~75 mm, 20日目 56~78 mm, 30 C 10日目 23~62 mm, 37 C 発育不能, 集落裏面は褐色調, 他の諸性質は同上.

亜硝酸塩寒天培養にては特長的に発育不能.

本菌株は土壌又は自然界の色々の試料より分離され分布が広い.

39. *Penicillium crustosum* Thom

Colonies on Czapek agar growing rapidly spreading, attaining a diameter of 49 to 68 mm. in 10 to 12 days at 25 C; 20 to 50 mm. at 30 C, seldom growing at 37 C; (growing little or not on NO_2-medium); typically fasciculate, smooth or radially furrowed, with growing margin about 0.2 to 2.0 mm. wide, white, otherwise heavily sporing throughout, in bright yellow green or yellow green, in some strains bluish-yellow green shades near American Green Winter Green, French Green, becoming dull yellow green, dull bluish green or grayish olive shades, characteristically developing continuous crusts of conidial chains which break off as irregular masses when the culture dish is struck or tapped, exudate limitedly or abundantly, colorless or nearly so, odor strong earthy, *reverse colorless or pale yellow shades*, surrounding agar colorless, penicilli asymmetric and biverticillate, comparatively larger (Fig. M-39); conidiophores arising from the substratum or basal felt, mostly 60 to 140 μ or 600 μ by 3.7 to 6.0 μ, with apices somewhat enlarged up to 4.0 to 6.3 μ in diameter, with typically granular walled, branches variable *9.3 to 37 μ by 2.8 to 5.3 μ with* granular walled, metulae loosely compact verticils of 2 to 5, mostly 9.3 to 18.7 μ by 2.5 to 4.5 μ, with walls granular, sterigmata loosely compact or parallel verticils of 3 to 6 mostly 8.7 to 12.5 μ by 2.1 to 3.6 μ, acute type, conidia globose to subglobose, mostly 2.5 to 4.4 μ, with walls smooth or nearly so, and the smooth or nearly so walls are shown by electron microscopy (Fig. E-39), conidial chains tangled or loosely parallel up to 60 to 320 μ in length.

Colonies on steep agar growing somewhat more rapidly, 38 to 75 mm in 10 to 12 days at 25 C, 23 to 62 mm at 30 C seldom growing at 37 C, reverse becoming brownish shades near Natal Brown, the other characters as on Czapek.

Strains of this species isolated from soils and many materials in nature.

And the species widely distributed in nature.

*Thom, C., The Penicillia 399 1930
**Raper, K. B. Thom, C. and Fennell, D. I., A Manual of the Penicillia, pp 516-518 1949
***Abe, S. J. Gen. Appl. Microbiology 105-106 1956.



Fig. M-39 A. *Penicillium crustosum* Thom, FAT 703, low power view of colony section showing typically fasciculate of texture

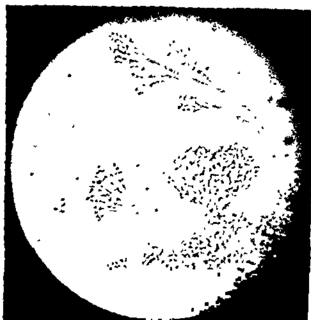


Fig. M-39 B. *Penicillium crustosum* Thom, FAT 735, details of penicilli

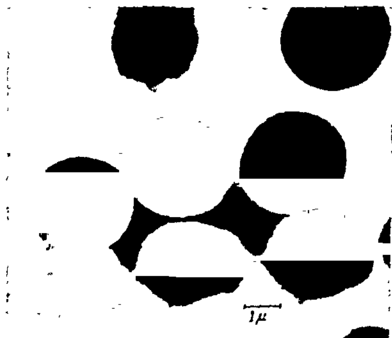


Fig. E-39. *Penicillium crustosum* Thom, FAT 735, conidia showing the smooth or nearly so walls and the globose to subglobose form.

40. *Penicillium viridicatum* Westling

40. *Penicillium viridicatum* Westling



Fig. M-40 A. *Penicillium viridicatum* Westling, FAT 818, low power view of colony section showing typical fasciculate character of texture.

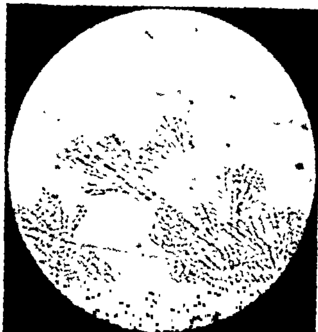


Fig. M-40 B. *Penicillium viridicatum* Westling, FAT 818, detail, of penicilli

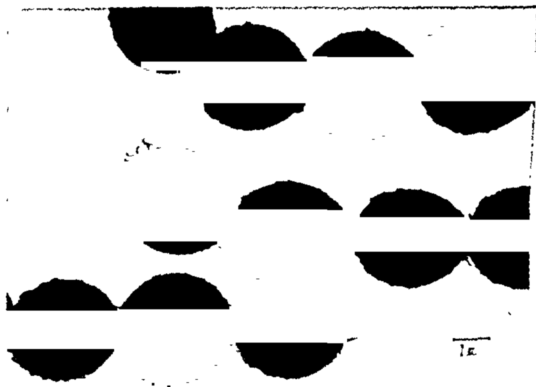


Fig. E-40. *Penicillium viridicatum* Westling, FAT 818, conidia showing the slightly rough walls and the globose or ovate form



Fig C-40. *Penicillium viridicatum* Westling, FAT 818, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C にて5日目 17~19mm, 10日目 52~68mm (Fig C-40), 20日目 64~68mm, 30°C 10日目 18~41mm, 37°C 発育不能；菌叢束状，平滑又は放射状皺を有し，分生胞子着生は全面的 又は或る菌株にては集落円周部附近，中間部のみに多い，集落円周部は白色, 0 3~1.5mm. 幅，分生胞子着生部は特長的に鮮明黄緑色調（約 4 週間保つ），順次くすんだ黄緑色調を呈す；滲出物は僅小又は豊富，無色又は淡黄色，集落裏面は黄，橙，又は橙褐色調，集落周辺寒天は桃，淡褐，黄色調に広く着色；ペニシラスは不整斉輪生状，比較的大型 (Fig M-40)，分生胞子柄は 190~450 μ×3 7~5 0 μ，頂端部 4 0~5 6 μ，顆粒状粗面；ペニシラスは屡々不規則で，分枝，基底梗子，は異った段階位置に一貫しては作らない，常に 1~3 ヶ群生の分枝は 12~37 μ×2 5~4 5 μ，一段又は 2 段又は以上に分岐す，基底梗子は粗密状様に 2~5 ヶ群生, 8 7~17 μ, 顆粒状粗面，梗子は粗密状様に 3~6 ヶ着生，8 1~12 5 μ×1 8~3 7 μ，分生胞子球形 卵形又は亜球形，2 1~3 1 又は4 1 μ，滑面，又電子顕微鏡写真 (Fig E-40) にては 0 1 μ 以下の僅小な粗面，分生胞子連鎖は縺状又は並行状，長さ 30~160~250 μ

スティープ寒天培養に於ける集落の発育は 25 C にて 5日目 18~20mm, 10日目 35~53mm 20日目 65~72mm, 30 C 10日目 23~41mm, 37 C 発育不能，不明確な又僅小な放射状皺を有し，他の諸特性は同上

亜硝酸塩寒天培養に於ては特長的に発育不能 本菌种は土壌，又はチーズ，及腐敗試料より分離さる

40 *Penicillium viridicatum* Westling

Colonies on Czapeck agar growing rather rapidly, attaining a diameter of 52 to 68 mm in 10 to 12 days at 25°C; (Fig C-40), 18 to 41 mm at 30°C, seldom growing at 37°C; (growing little or not on NO_2-medium), fasciculate, smooth or radial furrows, heavily sporing throughout in some strains, less heavily sporing in others with conidial development heaviest in marginal to submarginal zones, with a white margin 0 3 to 1 5 mm wide; conidial areas when young characteristically in bright yellow green shades near Spinach Green, Cedare Green, usually remaing persistently green (during about 4 weeks), becoming similar shades or Cedar Green, Parrot Green, exudate limitedly or abundantly, colorless or pale yellow color, odor strong, moldy, and in some strains sourish, reverse yellow, orange or orange-brown shades, with surrounding agar pinkish, light brown or yellow shades broadly pigmented; penicilli asymmetrical and biverticillate, comparatively large (Fig M-40), conidiophores commonly 190 to 450 μ by 3 7 to 5 0 μ, with apices somewhat enlarged up to 4 0 to 5 6 μ with granular walled, penicilli often irregular, with branches, metulae and sterigmata not consistently produced at different levels, usually showing 1 to 3 branches 12 to 37 μ by 2 5 to 4 5 μ, occasionally showing secondary branches, with each branch or sub branch 2 to 5 metulae, loosely compact, mostly 8 7 to 17 μ by 2 2 to 3 8 μ, with walls typically granular, sterigmata commonly in clusters of 3 to 6, loosely compact, measuring 8 1 to 12 5 μ by 1 8 to 3 7 μ, usually borne at approximately the same level in some strains, not in others, conidia globose or ovate, subglobose, usually 2 1 to 3 1 μ or 4 1 μ, with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-40), and conidial chains tangled or parallel, up to 30 to 160 μ or 250 μ in length.

Colonies on steep agar growing rather slowly or rapidly spreading, 35 to 53 mm in 10 to 12 days at 25°C; 23 to 41 mm at 30°C, seldom growing at 37°C, loosely or slightly radial furrowed, the other characters as on Czapek

Strains of this species isolated from the soils and deteriorating materials and infected cheeses

*Westling, R Arkiv for Botanik 11 53, 89 90, figs 14 and 56 1911

**Thom, C The Penicillia, p 394 1930

***Raper, K B, Thom, C and Fennell D I A Manual of the Penicillia, pp 482 497 1949

****Abe, S, J Gen Appl Microbiology pp 106 107 1956



Fig. M-40 A. *Penicillium viridicatum* Westling, FAT 818, low power view of colony section showing typical fasciculate character of texture.

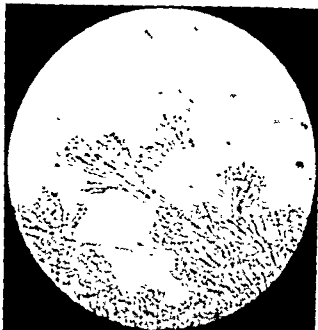


Fig. M-40 B. *Penicillium viridicatum* Westling, FAT 818, detail, of penicilli

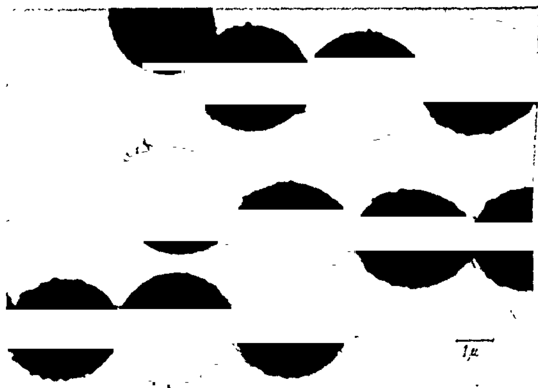


Fig. L-40. *Penicillium viridicatum* Westling, FAT 818, conidia showing the slightly rough walls and the globose or ovate form.

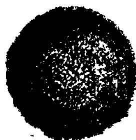


Fig C-40 *Penicillium viridicatum* Westling, FAT 818, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C にて5日目 17～19mm, 10日目 52～68mm (Fig C-40), 20日目 64～68mm, 30°C 10日目 18～41mm, 37°C 発育不能，菌叢束状，平滑又は放射状皺を有し，分生胞子着生は全面的 又は或る菌株にては集落円周部附近，中間部のみに多い，集落円周部は白色，0 3～1 5mm 幅，分生胞子着生部は特長的に鮮明黄緑色調（約 4 週間保つ)，順次くすんだ黄緑色調を呈す，滲出物は僅小又は豊富，無色又は淡黄色；集落裏面は黄，橙，又は橙褐色調，集落周辺寒天は桃，淡褐，黄色調に広く着色；ペニシラスは不整斉輪生状，比較的大型 (Fig M-40)，分生胞子柄は 190～450 μ×3 7～5 0 μ，頂端部 4 0～5 6 μ，顆粒状粗面，ペニシラスは屡々不規則で，分枝，基底梗子，は異った段階位置に一貫しては作らない，常に 1～3 ヶ群生の分枝は 12～37 μ ×2 5～4 5 μ，一段又は 2 段又は以上に分岐す，基底梗子は緩密状様に 2～5 ヶ群生，8 7～17 μ，顆粒状粗面，梗子は緩密状様に 3～6 ヶ着生，8 1～12 5 μ ×1 8～3 7 μ，分生胞子球形 卵形又は亜球形，2 1～3 1 又は4 1 μ，滑面，又電子顕微鏡写真 (Fig E 40) にては 0 1 μ 以下の僅小な粗面，分生胞子連鎖は縺状又は並行状，長さ 30～160～250 μ

スティープア入培養に於ける集落の発育は 25°C にて 5 日目 18～20 mm，10 日目 35～53 mm，20 日目 65～72 mm，30°C 10 日目 23～41 mm，37 C 発育不能，不明確な又僅小な放射状皺を有し，他の諸特性は同上

亜硝酸ア入培養に於ては特長的に発育不能 本菌種は土壌，又はチーズ，及腐敗試料より分離さる。

40. *Penicillium viridicatum* Westling

Colonies on Czapeck agar growing rather rapidly, attaining a diameter of 52 to 68 mm in 10 to 12 days at 25°C, (Fig C-40); 18 to 41 mm at 30°C; seldom growing at 37°C; (growing little or not on NO_2-medium), fasciculate, smooth or radial furrows, heavily sporing throughout in some strains, less heavily sporing in others with conidial development heaviest in marginal to submarginal zones, with a white margin 0 3 to 1 5mm wide, conidial areas when young characteristically in bright yellow green shades near Spinach Green, Cedare Green, usually remaing persistently green (during about 4 weeks), becoming similar shades or Cedar Green, Parrot Green; exudate limitedly or abundantly, colorless or pale yellow color, odor strong, moldy, and in some strains sourish, reverse yellow, orange or orange-brown shades, with surrounding agar pinkish, light brown or yellow shades broadly pigmented, penicilli asymmetrical and biverticillate, comparatively large (Fig M-40); conidiophores commonly 190 to 450 μ by 3 7 to 5 0 μ, with apices somewhat enlarged up to 4 0 to 5 6 μ with granular walled; penicilli often irregular, with branches, metulae and sterigmata not consistently produced at different levels, usually showing 1 to 3 branches 12 to 37 μ by 2 5 to 4 5 μ, occasionally showing secondary branches, with each branch or sub-branch 2 to 5 metulae, loosely compact, mostly 8 7 to 17 μ by 2 2 to 3 8 μ, with walls typically granular, sterigmata commonly in clusters of 3 to 6, loosely compact, measuring 8 1 to 12 5 μ by 1 8 to 3 7 μ, usually borne at approximately the same level in some strains, not in others; conidia globose or ovate, subglobose, usually 2 1 to 3 1 μ or 4 1 μ, with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-40), and conidial chains tangled or parallel, up to 30 to 160 μ or 250 μ in length

Colonies on steep agar growing rather slowly or rapidly spreading, 35 to 53 mm in 10 to 12 days at 25°C, 23 to 41 mm at 30°C, seldom growing at 37°C, loosely or slightly radial furrowed, the other characters as on Czapek

Strains of this species isolated from the soils and deteriorating materials and infected cheeses

*Westling, R Arkiv for Botanik 11 53 83 90 figs 14 and 56 1911

**Thom, C The Penicillia p 394 1930

***Raper, K B, Thom C and Fennell D I A Manual of the Penicillia, pp 482 497 1949

****Abe, S, J Gen Appl Microbiology pp 106-107 1956

41. *Penicillium viridi-cyclopium* Abe

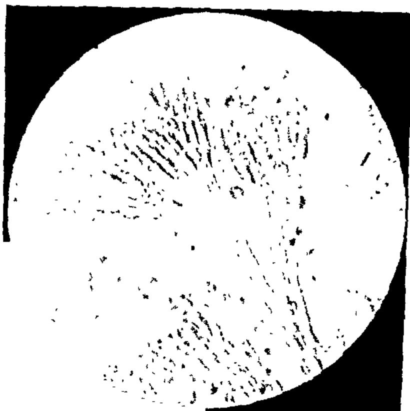


Fig. M-41. *Penicillium viridicyclopium* Abe, FAT 1041, detail of penicilli

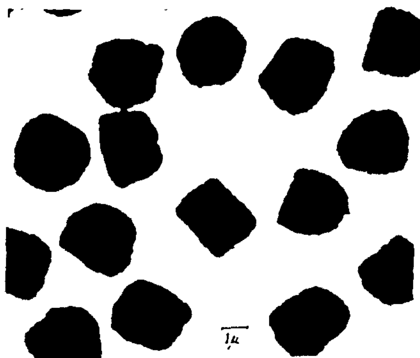


Fig. E-41. *Penicillium viridicyclopium* Abe, FAT 411, conidia showing the slightly [illegible]

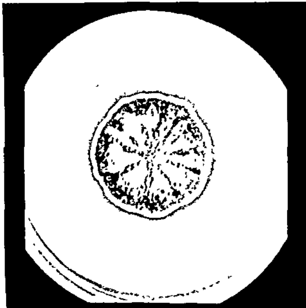


Fig. C-41. *Penicillium viridi-cyclopium* Abe, FAT 1044, on Czapek agar, 10 days.

ツァペック寒天培養に於ける集落の発育は 25°C にて 5日目 15~28 mm, 10日目 30~47 mm, (Fig. C-41) 20日目 46~65 mm, 30°C 10日目 17~33 mm, 37°C 発育不能, 集落は平滑又は皺があり, 集落円周部は白色, 0 8~1.5 mm 幅, 菌叢束状, 多くの菌株にては分生胞子着生は豊富, 分生胞子着生部は黄緑色或は青味を帯びた黄緑色, 順次同色調の濃呈色又は褐オリーブ色又は灰オリーブ色調を呈す, 集落周辺寒天は常に淡褐色或は桃褐色調, 順次橙褐或は褐色調に幅広く着色; 滲出物は僅小, 無色又は淡黄色調; 分生胞子柄は基質より直立し, 一般に 120~380~440 μ×3 7~5 6 μ, 頂端部 4 0~5 8 μ, 顆粒状粗面; ペニシラスは不整斉輪生状, 一段又はそれ以上の分枝を示し, 各々梗子を持った基底梗子が 2~5 ヶ群生している (Fig M 41), 分枝は変化に富み, 9 3~31 μ~37 μ×3 0~4 9 μ, 顆粒状粗面, 基底梗子は 7 5~15 6 μ×2 5~4 5 μ, 滑面, 梗子は密束状に, 又は類似様に 3~7 ヶ着生, 8 1~12 5 μ×2 1~3 1 μ, 分生胞子は球形又は亜球形, 2 1~3 8 μ, 滑面, 又電子顕微鏡写真 (Fig E-41) にては 0 1 μ 以下の僅小な粗面, 分生胞子連鎖は並行状又は縺状, 長さ 50~220~260 μ

スティープ寒天培養に於ける集落の発育は 25°C にて 5日目 18~28 mm, 10日目 29~47 mm, 20日目 54~70 mm; 30°C 10日目 16~30 mm, 37°C 発育不能; 集落表面は常に放射状の皺を有す, 他の諸性状は同上。

亜硝酸寒天培養においては殆ど発育不能。本菌種は土壌及び腐敗物より分離される。

41 *Penicillium viridi-cyclopium* Abe

Colonies on Czapek agar growing rather rapidly, attaing a diameter of 30 to 47 mm in 10 to 12 days at 25°C (Fig C-41), 17 to 33 mm at 30°C, seldom growing at 37°C, (growing little or not on NO_2-medium), surface smooth or loosely furrowed, with a white margin 0 8 to 1 5 mm wide, typically slightly fasciculate, abundantly sporulating throughout in most strains; conidial areas in typical yellow green or bluish yellow green colors in some strains typical blue green near Deep Dull Yellow Green, American Green, Empire Green, Dark Zinc Green, Dark Russian Green, becoming similar or darker shades slate olive, grayish olive shades, with surrounding agar usually quickly developing cinnamon or pinkish cinnamon shades, becoming orange cinnamon or brownish shades broadly pigmented, exudate limited, colorless or pale yellow, odor abundant, moldy; conidiophores primarily arising from the substratum, commonly up to 120 to 380 or 440 μ in length by 3 7 to 5 6 μ in diameter, apices 4 0 to 5 8 μ in diameter, with typical granular walls; penicilli biverticillate and asymmetrical, commonly showing one or more branches in addition to the main

walls or nearly so, sterigmata in fairly compact or loosely compact verticils of 3 to 7, mostly 8 1 to 12 5 μ by 2 1 to 3 1 μ, acute type; conidia globose to subglobose, mostly 2 5 to 3 8 μ smooth or nearly so walled and the slightly rough walls are shown by electron microscopy (Fig E-41), conidial chains loosely parallel or tangled up to 50 to 220 or 260 μ in length

Colonies on steep agar rather rapidly, 29 to 47 mm in 10 to 12 days at 25 C, 16 to 30 mm at 30 C, seldom growing at 37 C, surface usually radially furrowed the other characters are as described above

Strains of this species isolated from the soils and deteriorating materials.

*Abe ... Gen. Appl. Microbiology ... 1956.

42. *Penicillium palitans* Westling



Fig. C-42. *Penicillium palitans* Westling, FAT 838, detail of penicilli

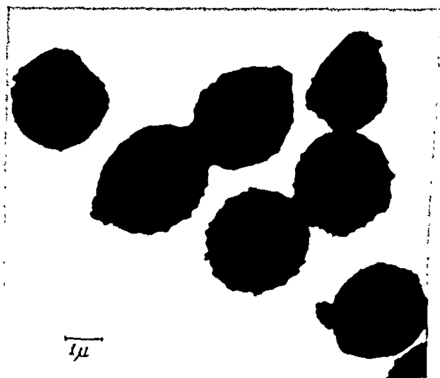


Fig. E-42. *Penicillium palitans* Westling, FAT 838, conidia showing the slightly rough walls and the globose to subglobose form



Fig. C-42. *Penicillium palitans* Westling, FAT 838, on Czapek agar, 10 days

ツァペック寒天培養における集落の発育は 25°C にて 5日目 22～23 mm，10日目 42～50 mm (Fig. E-42)，20日目 58～62 mm；30°C 10日目 28～33 mm；37°C 発育不能；集落の高さは中間部乃至円周部にては 200～700 μ，中心部は 800～900 μ．集落表面は顆粒状又は粉状を呈し，顕著な束状菌叢ではなく，幾分か束状，平滑，又は浅いか乃至は顕著な放射状皺を有し，集落円周部は白色，約 0.8 mm 幅；多くの菌株は分生胞子の着生豊富，分生胞子着生部は暗黄緑色，滲出物は僅小又は欠，無色；集落裏面は無色又は淡黄色調，集落周辺寒天は無色，ペニシラスは不整斉輪生状，比較的大型で分生胞子柄上に 1～2 段の分枝を有す (Fig M-42)；分生胞子柄は 120～380 μ×4.1～5.9 μ，頂端部 4.3～6.3 μ，顆粒状粗面，分枝は 12.5～33 μ×3.7～5.3 μ，基底梗子は 3～5 ヶ輪生状に群生，9.3～18.7 μ×2.8～4.7 μ，梗子輪生状様に 3～6 ヶ着生，9.3～12.5 μ×2.5～3.6 μ，分生胞子球形又は亜球形，2.8～4.2 μ，滑面，又電子顕微鏡写真 (Fig E 42) にては 0.1 μ 以下の微小粗面，分生胞子連鎖は縺状又は並行状様，長さ 120～380 μ．

スティープ寒天培養における集落の発育は 25°C にて 5日目 24～28 mm，10日目 42～62 mm，20日目 66～70 mm，30°C 10日目 28～32 mm，37°C 発育不能，他の諸特性は同上．

本菌種は土壌，パルプ粕，梨，等より分離さる．

42. *Penicillium palitans* Westling

Colonies on Czapek agar rather rapidly, a diameter of 42 to 50 mm in 10 to 12 days at 25°C

to submarginal areas up to 800 to 900 μ in colony center, surface appearing granular or mealy but *generally not conspicuously fasciculate, slightly* fasciculate, with smooth or shallow to prominent radial furrows, growing margin white, about 0.8 *mm. wide, heavily sporing throughout in most* strains, conidial areas in darker yellow green shades near Andover Green or Vetiver Green, exudate limitedly, colorless, not in others, odor pronounced, moldy; reverse colorless or pale yellow colors, with surrounding agar colorless; penicilli asymmetrica and biverticillate, comparatively large, generally showing 1 or 2 branches in addition to the main axis, (Fig. M-42); conidiophores mostly 120 to 380 μ by 4.1 to 5.9 μ with apices somewhat enlarged up to 4.3 to 6.3 μ in diameter, with granular walled, branches commonly ranging from 12.5 to 33 μ by 3.7 to 5.3 μ, metulae in groups of 3 to 5, mostly 9.3 to 18.7 μ by 2.8 to 4.7 μ, loosely compact; sterigmata usually borne in loosely compact verticils of 3 to 6 measuring 9.3 to 12.5 μ by 2.5 to 3.6 μ, conidia globose to subglobose, mostly 2.8 to 4.2 μ, with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig F-42), conidial chains tangled or loosely parallel, up to 120 to 380 μ in length

Colonies on steep agar growing more rapidly, 42 to 62 mm in 10 to 12 days at 25°C; 28 to 32 mm at 30 C, seldom growing at 37°C, the other characters as on Czapek

Strains of this species isolated from soils and pulp-mill and pears and the others

*Westling R., Arkiv for Botanik 11 53 83 86 figs 12 and 54 1911

**Thom C., The Penicillia, pp 396 397 1930

***Raper, K. B., Thom C and Fennell D I A Manual of the Penicillia pp 438 439 1949

****Abe S., *J Gen Appl Microbiology* 109 1956

43. *Penicllium cyclopium* Westling



Fig. M-43 A. *Penicillium cyclopium* Westling, FAT 1052, low power view of colony section showing fasciculate character of texture

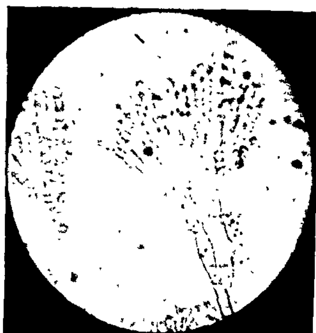


Fig. M-43 B. *Penicillium cyclopium* Westling, FAT 1052, detail of a single penicillus

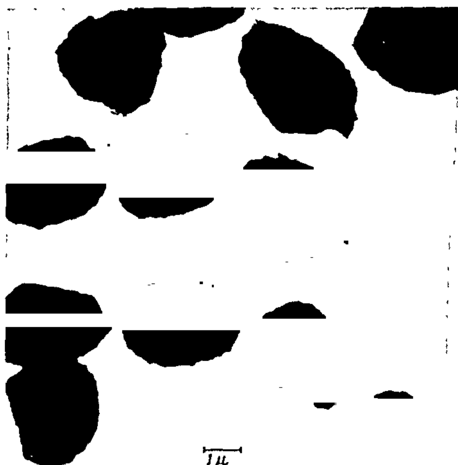


Fig. E-43. *Penicillium cyclopium* Westling, FAT 1052, conidia showing the slightly rough walls and the elliptical or ovate to subglobose form

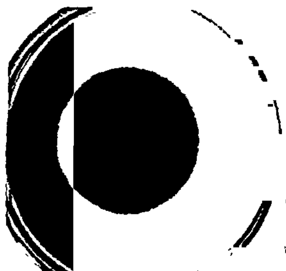


Fig C-43 *Penicillium cyclopium* Westling, FAT 642, on Czapek agar, 10 days

ツァペック氏寒天培養に於ける集落の発育は 25°C にて、5日目 21~32 mm、10日目 43~60 mm；(Fig C-43) 20日目 57~66 mm、30°C 10日目 21~48 mm、37°C 発育不能，集落平滑又は放射状皺を有し，時に輪紋帯状に発育，表面は顆粒状又は粉状で，菌糸束状；集落周縁部は白色，緻密，約 10~12 mm 幅，分生胞子着生全面的；分生胞子着生部は青緑色調，順次濃青緑又はくすんだ青緑色調を呈す；滲出物は欠又は僅小，無色；集落裏面は無色又は薄灰褐色，灰色調，集落周辺寒天は無色；ペニシラスは大きく，不整斉輪生状，常に一乃至以上の分枝を有す (Fig M-43)；分生胞子柄は基質より直立，120~380 μ×3 4~5 6 μ，頂端部は膨大 3 7~5 9 μ，顆粒状粗面，分枝は変化に富み，9 3~31 μ×2 8~4 7 μ 顆粒状粗面，基底梗了 [illegible] 状に 2~6 ヶ着生 8.7~13 7 μ×2 8~4 0 μ 頂端部 3 1~4 6 μ，梗子は粗密状様に 4~7 ヶ群生，8 7~12 5 μ×2 1~3 4 μ；分生胞子は楕円 卵形又は亜球形，2 8~4 1 μ×2 1~3 2 μ，滑面，電子顕微鏡写真 (Fig E-43) にては 0 1 μ 以下の微小粗面，分生胞子連鎖は円柱状様又は並行状，長さ 60~250 μ

スティープ氏寒天培養に於ける集落の発育は 25°C にて 5日目 25~35 mm、10日目 48~68 mm、20日目 65~74 mm；30°C 10日目 25~55 mm，37°C 発育不能；他の諸特性は同上

亜硝酸塩寒天培養にては特に的に発育不能

本菌種は土壌及び其の他の試料より分離さる

43. *Penicillium cyclopium* westling

Colonies on Czapek agar growing rapidly, attaining a diameter of 43 to 60 mm in 10 to 12 days at 25°C, 21 to 48 mm at 30°C, seldom growing at 37°C; (growing little or not on NO_2-medium), smooth or loosely radially furrowed, azonate or broadly zonate in age, surface appearing granular or mealy, fasciculate, with margin compact, white, about 1 0 to 1 2 mm wide, heavily sporing throughout and shading quickly through blue green shades near Dark Russian Green or Bluish Gray Green, becoming similar shades or Dark Porcelain Green, Artmesia Green; exudate lacking or limitedly, colorless; odor pronounced, moldy, reverse colorless or light drab, smoke gray shades, with surrounding agar colorless, penicilli large, asymmetrica and biverticillate, usually showing one or more branches with metulae and sterigmata commonly borne at different levels (Fig M-43), conidiophores arising from the substratum, mostly 120 to 380 μ by 3 4 to 5 6 μ with apices somewhat enlarged up to 3 7 to 5 9 μ, with granular walled, branches variable, 9 3 to 31 μ by 2 8 to 4 7 μ with granular walled; metulae loosely compact verticils of 2 to 6, mostly 8 7 to 13 7 μ by 2 8 to 4 0 μ, with apices 3 1 to 4 6 μ, sterigmata usually borne in loosely compact verticils of 4 to 7,8 7 to 12 5 μ by 2 1 to 3 4 μ, conidia elliptical or ovate to subglobose, mostly 2 8 to 4 1 μ by 2 1 to 3 2 μ with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-43), conidial chains loosely column or parallel, up to 60 to 250 μ in length

Colonies on steep agar growing about 48 to 68 mm in 10 to 12 days at 25°C, 25 to 55 mm at 30 C, seldom growing at 37 C, the other characters as on Czapek

Strains of this species isolated from soils and deteriorating materials

*Westling, R Arkiv for Botanik 11, 55 56, 90 92, figs 15, 57 1911

**Thom C, The Penicillia pp 394 395 1930

***Raper, K B Thom, C and Fennell D I A Manual of the Penicillia, pp 493 497

****Abe S, J Gen Appl Microbiology 110 1956

44. *Penicillium aurantio-virens* Biourge



Fig. C-44 A. *Penicilium aurantio-rirens* Biourge, FAT 118, low power view of colony section showing typically fasciculate character of texture.

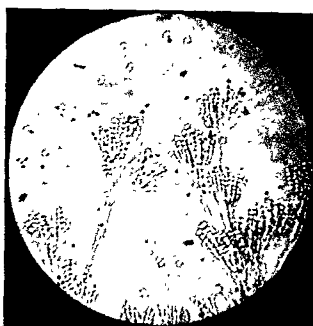


Fig. M-44 B. *Penicilium aurantio-virens* Biourge, FAT 1226, detail of penicilli



Fig. E-44. *Penicilium aurantio-virens* Biourge, FAT 1226, conidia showing the slightly rough walls and the elliptical or ovate form

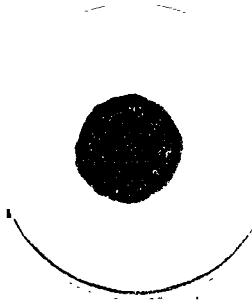


Fig. C-44. *Penicillium aurantio-virens* Biourge, FAT 1226, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C にて5日目 21~28 mm, 10 日目 43~48 mm (Fig C-44), 20 日目 55~70 mm ; 30°C, 10 日目 12~40 mm, 37°C 発育不能；菌叢は束状，集落平滑又は放射状様皺を有し，集落円周部は白色，約 1 0~1 5 mm 幅，分生胞子着生部は青緑色，青灰緑色，濃青緑色調，順次同色調又は暗濃オリーブ緑色調を呈し，或る菌株にては暗黄緑色調，滲出物僅少又は豊富，無色又は淡黄色調；集落裏面くすんだ黄色，順次褐色調，集落周辺寒天無色順次淡黄色調着色；ペニシラスは不整斉輪生状，(Fig M 44)，異ったレベルに梗子，基底梗子をもった不規則な分枝を有している，分生胞子柄は基質又は気菌糸より生育し，120~380 μ×37~62 μ，頂端部 46~68 μ，顆粒状粗面，分枝はサイズ変化に富み，93~29 μ×31~50 μ，顆粒状粗面，基底梗子常に緩密状様に 2~5 ヶ群生，81~156 μ×25~44 μ，頂端部31~50 μ；梗子3~5緩密状に着生，93~125 μ×2.3~36 μ，分生胞子楕円又は卵形 31~47 μ×26~40 μ 滑面，又電子顕微鏡写真 (Fig E 44) にては 01 μ 以下の僅小な粗面，分生胞子連鎖は緩状様又は平行状，長さ 60~190 μ

スティープ寒天培養に於ける集落の発育は 25 C にて5日目 16~37 mm, 10 日目 38~58 mm, 20 日目 57~72 mm, 30 C 10 日目 13~40 mm, 37 C 発育不能，他の諸性状は同じ

亜硝酸入培養にては特異的に発育不能 本菌株は土壌及び腐敗澱粉糊より分離さる。

44. *Penicillium aurantio-virens* Biourge

Colonies on Czapek agar growing somewhat rapidly, attaining a diameter of 43 to 48 mm. in 10 to 12 days at 25°C (Fig C-44); 12 to 40mm. at 30°C, seldom growing at 37°C; (growing little or not on NO_2-medium), fasciculate, smooth or loosely radial furrowed, with white margin about 1 0 to 1 5 mm wide, conidial areas blue green shades near Bluish Gray Green, Dark Zinc Green, Dark Russian Green, becoming similar shades or Dusky Olive Green, some strains dark yellow green shades, exudate limited or abundant, colorless or pale yellow shades; odor strong, moldy; reverse in dull yellow color becoming brownish shades, with surrounding agar colorless becoming dull yellow shades pigmented, penicilli asymmetric and biverticillate (Fig M-44), irregularly branched with metulae and sterigmata commonly borne at different levels; conidiophores arising from the substratum or as branches from aerial hyphae, commonly 120 to 380 μ by 3 7 to 6 2 μ, with apices somewhat enlarged up to 4 0 to 6 8 μ, with apices granular walled, branches variable in size, commonly 9 3 to 29 μ by 3 1 to 5 0 μ with granular walled, metulae usually in clusters of 2 to 5, loosely compact, commonly 8 1 to 15 6 μ by 2 5 to 4 4 μ, with apices 3 1 to 5 0 μ; sterigmata loosely compacte verticils of 3 to 5, commonly 9 3 to 12.5 μ by 2 3 to 3 6 μ; conidia elliptical or ovate, mostly 3 1 to 4 7 μ by 2 6 to 4 0 μ, with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-44), conidial chains loosely tangled or parallel, up to 60 to 190 μ in length

Colonies on steep agar growing about 38 to 58 mm in 10 to 12 days at 25°C, 13 to 40 mm at 30 C, seldom growing at 37 C, the other characters as on Czapek.

Strains of this species isolated from soils and spoiled starch paste.

*Biourge, PH, Monograph, La Cellule 33 fasc 1 pp 119 121 1923

**Thom, C The Penicillia pp 316 317 1913

***Raper K B Thom, C and Fennell, D I A Manual of the Penicillia pp 503 505

****Abe S, J Gen Appl Microbiology pp 110 111 1956

45. *Penicillium palitans* Westling var. echinoconidium Abe

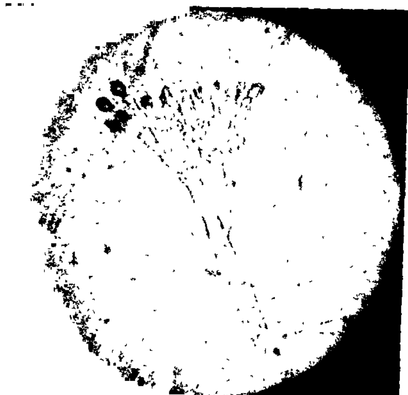


Fig. M-45. *Penicillium palitans* Westling var. echinoconidium Abe, FAT 815, detail of the single penicillus.



Fig. E-45. *Penicillium palitans* Westling var. echinoconidium Abe, FAT 815, conidia showing the conspicuously echinulate or verrucose walls and the globose form.

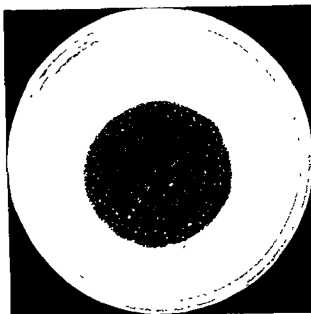


Fig. C-45. *Penicillium palitans* Westling var echinoconidium Abe, FAT 848, 10 days.

ツァペック寒天培養に於ける集落の発育は25°Cにて5日目24~26 mm, 10日目50~53 mm (Fig C-45); 20日目62~65 mm, 30°C 10日目27~28 mm; 37°C発育不能。集落は放射状の皺を有し、表面は顆粒状乃至明確な房状をなし、菌叢束状、分生胞子は全面に着生。集落円周部は白色、約1.5 mm幅；分生胞子着生部は暗濃黄緑色調順次暗オリーブ緑色調を呈す，滲出物は僅小，無色；集落裏面は無色又は淡黄色，順次淡褐色調，集落周辺寒天は無色，順次淡黄色調着色，分生胞子柄は基質より直立し，120~320 μ×4.3~6.0 μ，頂端部4.3~6.3 μ，顆粒状粗面，ペニシラス不整な輪生状で1~2ヶの各分枝を有し，同一ペニシラス上にも屡々不均一 (Fig M-45)，分枝は11.2~24 μ×3.4~5.0 μ，基底梗子は3~5ヶ散点状様に群生，9.3~13.7 μ又は18.7 μ×2.8~4.7，梗子4~8ヶ散点状様に着生，10~11.9 μ×2.5~3.1 μ；分生胞子，球形又は亜球形，3.1~4.3 μ著しい棘刺状又は瘤状粗面，又電子顕微鏡写真 (Fig E-45)にても同一様粗面，分生胞子連鎖は変化に富み，縺状，並行状様又は散開状様，長さ60~120 μ.

スティープ寒天培養に於ける集落の発育は25°Cにて5日目28~30, 10日目51~55 mm, 20日目70~72 mm, 30°C 10日目, 28~30 mm, 37°C発育不能，他の諸特性は上記同一様，亜硝酸寒天培養にては特異的に発育不能

本菌種は土壌又は腐敗試料より分離さる

45. *Penicillium palitans* Westling var. *echinoconidium* Abe.

Colonies on Czapek agar rather rapidly spreading a diameter of 50 to 53 mm in 10 to 12 days at 25°C (Fig. C-45); 27 to 28 mm at 30°C; seldom growing at 37°C, (growing little or not on NO_2-medium), usuall radially furrowed, and with surface appearing granular to definitely tufted, typically fasciculate, heavily sporulating throughout, with a white margin about 1.5 mm wide; conidial areas in dark yellow green shades, near Dusky Yellow Green, becoming dark olive near Dusky Olive Green with age, exudate limited, colorless, odor, definitely moldy, reverse colorless or pale yellow, becoming pale brown, with surrounding agar usually colorless, becoming tardily pale yellow, conidiophores usually arising directly from the substratum, commonly up to 120 to 320 [illegible] appeard and often unequal in the same penicillus (Fig M-45) commonly ranging from 11.2 to 24.0 μ by 3.4 to 5.0 μ; bearing metulae in groups of 3 to 5 loosely compact, mostly 9.3 to 13.7 μ or occasioanlly 18.7 μ by 2.8 to 4.7 μ, sterigmata usually borne in loosely compact verticils of 4 to 8, mostly 10.0 to 11.9 μ by 2.5 to 3.1 μ, acute type, conidia globose to subglobose, mostly 3.1 to 4.3 μ, with walls conspicuously echinulate or verruculose, conidial chains variable, tangled, loosely parallel or divergent, up to 60 to 120 μ in length, conidia walls typically conspicuously echinulate or verruculose as shown in electron microscopy (Fig E-45)

Colonies on steep agar rather rapidly, 51 to 55 mm in 10 to 12 days at 25°C, 28 to 30 mm at 30°C, seldom growing at 37°C, the other characters are as described above

Strains of this species isolated from soils and ating materials

Gen Appl Microbiology 111 112 197?

46. *Penicillium cyclopium* Westling var. *echinulatum* Raper and Fennell



Fig. M-16. *Penicillium cyclopium* Westling var. *echinulatum* Raper and Fennell, FAT 987, detail of penicilli.

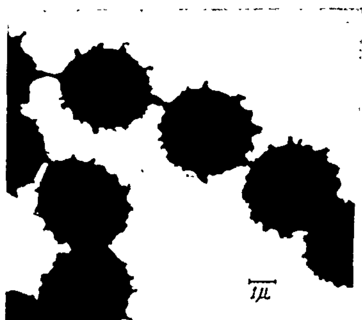


Fig. E-16. *Penicillium cyclopium* Westling var. *echinulatum* Raper and Fennell, FAT 987, conidia showing the conspicuously echinulate or verruculose walls and the globose to subglobose form.

47. *Penicillium urticae* Bainier.



Fig. M-47. *Penicillium urticae* Bainier, FAT 1315, detail of penicilli



Fig. E-47. *Penicillium urticae* Bainier, FAT 1315, conidia showing the smooth or nearly so walls and the typically elliptical form

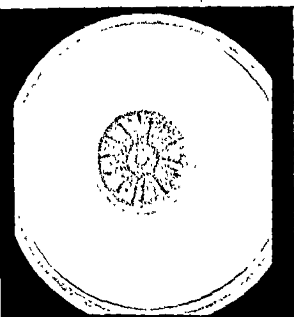


Fig C-47. *Penicillium urticae* Bainier, FAT 1315, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C にて5日目 14~15 mm, 10 日目 30~32 mm (Fig C-47), 20 日目 50~52 mm, 30°C 10 日目 30~32 mm, 37°C 発育不能，放射状皺を有し，表面は明確な顆粒状，荷叢束状で，集落周縁部にては著しい束状を呈す，白色，約 10~12 mm 幅；分生胞子着生全面的，分生胞子着生部は暗緑色調；滲出物は僅小，くすんだ黄色又は橙褐色調；集落裏面はくすんだ黄色又は橙褐色調，集落周辺寒天は淡褐色調に着色；ペニシラスは不整斉輪生状，散開状様，比較的大型で，形，各サイズは変化に富み (Fig M 47)，不均一の所より各微細構造をもった分枝が各種に分岐している，分生胞子柄は一団と束状，又は束状に単立し，波状にうねり，曲っており，180~600 μ×4 0~4 7 μ，頂端部 4 3~5 3 μ，滑面，分枝は散開状に着生し，10 6~22 μ×3 1~4 3 μ，基底梗子は輪帚状様に 2~4 ヶ群生し，比較的短く，6 2~7 5 μ×2 5~3 4 μ，頂端部 2 8~3 9 μ，梗子特徴的に短く，5 3~6 3 μ×1 8~2 6 μ 輪帚状様に 3~5 又は以上群生；分生胞子楕円，2 8~3 6 μ×2 1~2 8 μ，滑面，又電子顕微鏡写真 (Fig E-47) にても同一様又は 0 1 μ 以下の僅小粗面，分生胞子連鎖は円柱状又は散開状様，長さ 60~120 μ

スティープ寒天培養に於ける集落の発育は 25°C にて5日目 18~20 mm，10 日目 43~47 mm，20 日目 53~56 mm，30°C 10 日目 40~42 mm，37°C 発育不能；他の諸特性は上記同一様

亜硝酸寒天培養においては特異的に発育不能 本菌種は土壌及び病変米等より分離さる

47. *Penicillium urticae* Bainier.

Colonies on Czapek agar growing restrictedly, attaining a diameter of 30 to 32 mm in 10 to 12 day at 25°C, 30 to 32 mm at 30°C (Fig C-41); seldom growing at 37°C, (growing little or not on NO_2-medium); radiately furrowed in most strains, surface distinctly granular in most strains, typically fasciculate with prominent fascicles usually produced at least in the marignal areas, heavily sporing throughout, with white margin colors; odor distinctive and fragrant in some strains, not pronounced in others; reverse dull yellow or orange cinnamon shades, wtih surrounding agar pale cinnamon color pigmented, penicilli asymmetric and biverticillate, loosely divergent, comparatively large but extremely variable in pattern and dimensions (Fig M-47); and various branched with bearing elements commonly arising at different levels, conidiophores partly in fascicles, partly simple, undulate or sinuate, commonly ranging up to 180 to 600 μ by 4 0 to 4 7 μ with apices somewhat enlarged up to 4 3 to 5 3 μ, with smooth or nearly so; branches divergent but commonly 10 6 to 22 μ by 3 1 to 4 3 μ; metulae loosely compact verticils of 2 to 4, comparatively short mostly 6 2 to 7 5 μ by 2 5 to 3 4 μ, with apices 2 8 to 3 9 μ, sterigmata characteristically short, mostly 5 3 to 6 3 μ by 1.8 to 2 6 μ, loosely compact verticils of 3 to 5 or more, conidia typically elliptical, mostly 2 8 to 3 6 μ by 2 1 to 2 8 μ, with smooth or nearly so walled, and the smooth or slightly rough walls are shown by electron microscopy (Fig E-47), conidial chains loosely column or divergent, up to 60 to 120 μ in length

Colonies on steep agar somewhat more rapidly than on Czapek, 43 to 47 mm in 10 to 12 days at 25°C, 40 to 42 mm at 30°C, seldom growing at 37°C, the other characters as on Czapek.

Strains of this species isolated from soils and diseased rice

*Bainier G Bul Soc Mycol France 23 P 1 V, Figs 10 to 16 1907

**Thom C The Penicillia pp 418 419 1930

***Raper, K B Thom C and Fennell D I, A Manual of the Penicillia pp 534 537 1949

****Abe, S J Gen Appl Microbiology 112 113 1956

48. *Penicillium expansum* (Link) Thom



Fig. M-48 A. *Penicillium expansum* (Link) Thom, FAT 736, low power view of colony section showing tangled or loosely parallel of conidial chains.



Fig. M-48 B. *Penicillium expansum* (Link) Thom, FAT 736, detail of penicilli



Fig. I-48. *Penicillium expansum* (Link) Thom, FAT 736, conidia showing the slightly rough walls and the typically elliptical form.

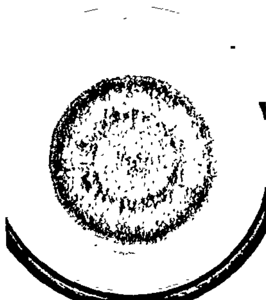


Fig. C-48. *Penicillium expansum* (Link) Thom, FAT 736, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C にて5日目 21〜23 mm; 10 日目 60〜62 mm (Fig C-48), 20 日目 68〜70 mm; 30°C 10 日目 40〜45 mm, 37°C, 発育不能; 集落表面は平滑又は皺があり, 分生胞子の着生全面的, 分生胞子柄は豊富で規則的に基質より直立し, 又或る菌株にては連続的に緻密に直立, 又他菌株にては明確に束又は房状を呈するか単立分生胞子柄もある, 又或る菌株にては集落表面が粉状乃至顆粒状外観を呈する, 束状に分生胞子が集っている, 集落円周部は白色約 1 0 mm 幅; 分生胞子着生部はくすんだ黄緑色調; 滲出物は欠又は僅小, 無色又は薄黄色調; 集落裏面は黄褐色調, 集落周辺寒天は桃色又は薄黄褐色調に着色; ペニシラスは不整斉輪生状, 比較的大型(Fig M-48); 分生胞子柄は 60〜390 μ×3 4〜5 0 μ, 頂端部 4 5〜5 6 μ, 滑面, 分枝は 12 5〜31 μ×3 2〜4 7 μ, 基底梗子は 2〜4 ヶ輪生状様に群生, 10 15 7 μ×2 8〜5 4 μ, 頂端部 3 1〜4 9, 梗子 3〜6 ヶ輪生状様に群生, 9 3〜15 6 μ×2 5〜3 1 μ, 分生胞子は楕円, 3 1〜4 4 μ×2 5〜3 1 μ 滑面, 又電子顕微鏡写真 (Fig E-48) にても 0 15 μ 以下の僅小粗面, 分生胞子連鎖は縺状又は並行様, 長さ 120〜250 μ, スティープ寒天培養に於ける集落の発育は 25°C にて 5 日目 22〜25 mm, 10 日目 62〜65 mm, 20 日目 70〜75 mm, 30°C 10 日目 42〜47 mm, 37 C 発育不能, 他の諸性質は上記同一様。

亜硝酸塩寒天培養に於ては特異的に発育不能。

本菌種は土壌又は果実類より分離さる

48. *Penicillium expansum* (Link) Thom.

Colonies on Czapek agar growing rapidly, attaining a diameter of 60 to 62 mm. in 10 to 12 days at 25°C (Fig C-48); 40 to 45 mm at 30°C; seldom growing at 37°C; (growing little or not on NO_2-medium), surface smooth or loosely furrowed, heavily sporing throughout with conidiophores very abundant and regularly arising from the substratum, in some strains occurring in an almost continuous dense stand, in others showing some definite fascicles or clusters but with the majority of the conidiophores arising singly, in still other strains with [illegible]

t
s
r
y
b

[illegible], colorless or pale yellow color; odor strongly, moldy, reverse yellow brownish shades, with surrounding agar pinkish or lightly yellow-brownish shades pigmented; penicilli asymmetrical and biverticillate, comparatively larger (Fig. M-48), conidiophores mostly 60 to 390 μ by 3.4 to 5.0 with apices somewhat enlarged up to 4.5 to 5.6 μ in diameter, with smooth or nearly so walled; branches mostly 12.5 to 31 μ by 3.2 to 4.7 μ; metulae usually borne in verticils of 2 to 4, loosely compact, mostly 10 to 15.7 μ by 2.8 to 4.5 μ, with apices 3.1 to 4.9 μ; sterigmata in groups 3 to 6, loosely compact, commonly 9.3 to 15.6 μ by 2.5 to 3.1 μ, conidia typically elliptical, mostly 3.1 to 4.4 by 2.5 to 3.1 μ, with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-48); conidial chains tangled or loosely parallel, up to 120 to 250 μ in length.

Colonies on steep agar growing somewhat rapidly than on Czapek, 62 to 65 mm. in 10 to 12 days at 25°C; 42 to 47 mm. at 30°C; seldom growing at 37 C; the other characters as on Czapek.

Strains of this species isolated from soils and fruites

*Thom, C., U. S. [illegible], [illegible], pp. 27-28, fig. 1 [illegible], The Penicillia, pp. [illegible], figs. 60 and 61 [illegible]

**Link, H. F., [illegible], p. 17, [illegible]

***Raper, K. B., Thom, C. and Fennell, D. I.: A Manual of the Penicillia, pp. 512-[illegible], [illegible]

****Abe, S., J. Gen. Appl. [illegible], 113 [illegible]

49. *Penicillium martensii* Biourge

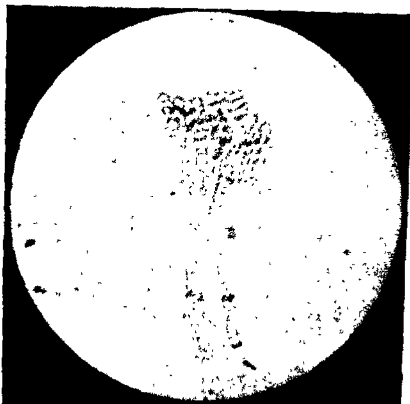


Fig. M-49. *Penicillium martensii* Biourge, FAT 1201, detail of penicilli

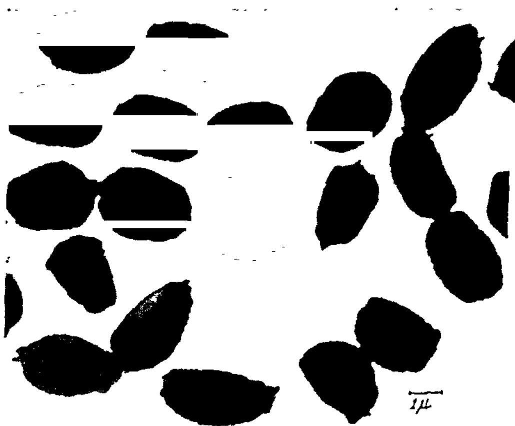


Fig. E-49. *Penicillium martensii* Biourge, FAT 1201, conidia showing the slightly rough walls and the typically elliptical or ovate form

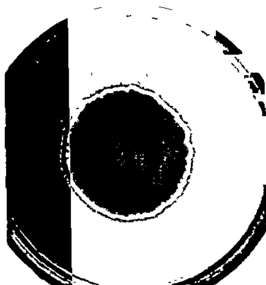


Fig. C-49. *Penicillium martensii* Biourge, FAT 1201, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は25°Cにて5日目 13～27 mm, 10日目 30～53 mm (Fig C-49), 20日目 55～58 mm; 30°C 10日目 15～53 mm; 37°C 発育不能; 菌叢束状, 平滑又は放射状皺を有し, 集落周辺部は白色, 約0 5 mm幅, 表面は顆粒状乃至は房状, 分生胞子の着生全面的, 分生胞子は集落近円周部にては青緑色又は青灰緑色調, 中心部にては濃青灰緑色調, 順次くすんだ緑色又は暗青灰色調を呈す; 滲出物は欠又は僅小, 又は豊富, 淡黄色調; 集落裏面は橙褐色又は赤褐色調, 順次黒褐色調, 集落周辺寒天は淡褐色調, 順次暗褐色調に着色; ペニシラスは不整斉輪生状, 比較的大型, 常に主軸上に一又は二ケの分枝を有す (Fig M 49), 分生胞子柄は基質より直立し, 長さは変化に富み, 90～380 μ×3 1～5 0 μ, 頂端部は僅かに膨大し 3 4～5 6, 滑面, 分枝は変化に富み, 11 2～22 μ×2 9～4 5 μ, 基底梗子は 3～4 ケ輪密状様に群生し, 8 1～12.5 μ×2 5～4 1 μ, 梗子は 4～7 ケ輪密状又は類似様に着色, 6 8～9 4 μ×2 1～3 1 μ, 先端部幾分か細い; 分生胞子は楕円又は卵形, 3 1～4 2 μ×2 1～3 3 μ, 滑面, 又電子顕微鏡写真 (Fig. E-49) にては 0 1 μ 以下の僅小粗面, 分生胞子連鎖は錯状又は並行状様, 長さ 60～200 μ

スティープ寒天培養に於ける集落の発育は25°C, 5日目 14～33 mm 10日目 34～56 mm, 20日目 65～66 mm, 30°C 10日目 11～54 mm, 37°C 発育不能, 他の諸特性は上記同一様,

亜硝酸寒天培養においてはツァペック寒天同様良好なる発育を示す

本菌株は麦芽汁寒天にても良好な発育を示す 本菌は土壌及び腐敗果実類より分離さる

49. *Penicillium martensii* Biourge

Colonies on Czapek agar growing somewhat restrictedly or rapidly, attaining a diameter of 30 to 53 mm in 10 to 12 days at 25°C (Fig. C-49); 15 to 53 mm at 30°C; seldom growing at 37°C; (growing very well on NO_2-medium); typically fasciculate, smooth or radial furrowed with a white margin about 0 5 mm wide, with surface appearing granular to definitely tufted, heavily sporing throughout, conidial areas blue green or bluish gray green shades near Deep Bluish Glaucous in marginal areas and Artmesia Green or Deep Bluish Gray Green in central areas, becoming Sage Green or Dark Bluish Gray Green; exudate lacking or limited, abundantly, pale yellow color; odor often pronounced, moldy; reverse orange brown or reddish brown shades, becoming blackish brown shades, with surrounding agar light brownish color, becoming dark brown color pigmented, penicilli asymmetrical and biverticillate, comparatively large, usually showing one or two branches in addition to the main axis (Fig M-49); conidiophores arising from the substratum, variable in length but commonly ranging from 90 to 380 μ by 3 1 to 5 0 μ with apices somewhat enlarged up to 3 4 to 5 6 μ, with walls smooth or nearly so, branches variable, mostly 11.2 to 22 μ by 2 9 to 4 5 μ, metulae commonly 3 to 4 in the verticils, loosely compact, about 8 1 to 12.5 μ by 2.5 to 4 1 μ; sterigmata usually in clusters of 4 to 7, compact or loosely compact, measuring 6 8 to 9 4 μ by 2 1 to 3 1 μ, with apices somewhat narrowed, conidia typically elliptical or ovate, mostly 3 1 to 4 2 μ by 2 1 to 3 3 μ, with walls smooth or nearly so, and the slightly rough walls are shown by electron microscopy (Fig E-49); conidial chains loosely tangled or parallel, up to 60 to 200 μ in leegth Colonies on steep agar growing more rapidly than on Czapek, 34 to 56 mm in 10 to 12 days at 25 C, 11 to 54 mm at 30 C, seldom growing at 37°C, the other characters as on Czapek

Colonies on malt agar growing rapidly and luxuriantly growth

Strains of this species isolated from soils and spoiling fruits

*Biourge, Ph Monograph La Cellule 33 fasc 1 pp 119 121 Col Pl 1 fig 5 1923

**Thom, C The Penicillia, pp 312 317 1930

***Raper K B Thom C and Fennell, D I A Manual of the Penicillia pp 500 503 1949

****Abe S J Gen Appl Microbiology 113 114 1956

50. *Penicillium italicum* Wehmer



Fig. M-50. *Penicillium italicum* Wehmer, FAT 774, detail of penicilli

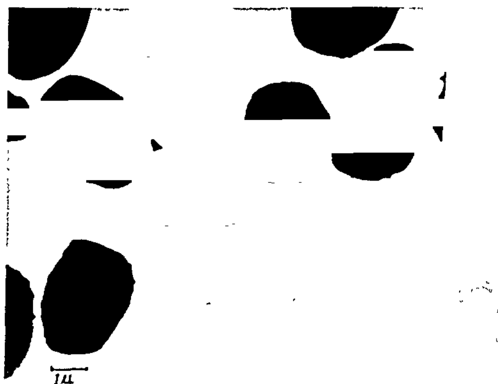


Fig. [illegible]-50. *Peni*[illegible] Wehmer, FAT [illegible] [illegible]
[illegible] cylindrical

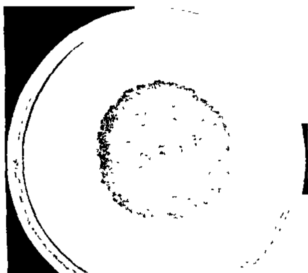


Fig. C-50. *Penicillium italicum* Wehmer, FAT 774 on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は25°C にて5日目約25 mm、10日目約47 mm (Fig C-50)、20日目約40 mm、30°C 10日目約40 mm、37°C 発育不能；集落平滑又は中心部隆起，菌叢は束状，順次粘束糸状を呈す，集落円周部は白色，0.2～0.5mm 巾，分生胞子着生部は近円周部にては青緑色調　中心部は暗黄緑色，順次濃青緑色，又はくすんだ青緑色調を呈す，滲出物は欠又は僅小，黄色調，集落裏面は黄色調，集落周辺寒天は無色；ペニシラスは不整複輪生状，比較的長く，主軸上に 1～3 ケの各種分枝を有す (Fig. M-50)，分生胞子柄は基質又は屢々寒天表面上又は近くの菌糸帯より直立，120～300 μ×3.5～4.8 μ，頂端部4.2～5.5 μ，滑面，分枝は変化に富み，14～27 μ×3.0～4.5 μ　頂端部 4.0～5.5 μ；基底梗子 2～4 ケ粗箒状様に群生，14～22 μ×3.0×4.2 μ，梗子 4～6 ケ粗箒状様に着生，8.3～12.4 μ×2.7～3.5 μ，分生胞子は長楕円形，3.4～5.8×2.8～3.7 μ，屢々大型 5.0～8.7×3.1～3.8 μ，滑面，電子顕微鏡写真 (Fig E-50) にても0.1 μ以下の微小粗面，分生胞子連鎖は鎖状又は並行状様，長さ 60～180 μ

スティープ寒天培養に於ける集落の発育は25 C にて 5 日目約 40 mm　10 日目約 64 mm　20 日目約 68 mm，30 C 10日目約68 mm，37 C 発育不能，分生胞子着生部は濃暗青緑色調，他の諸特性は上記同一様

亜硝酸塩寒天培養にてはツァペック寒天培養同様発育良好

本菌株は土壌又は病変果実類より分離さる

50 *Penicillium italicum* Wehmer

Colonies on Czapek agar growing rapidly, attaining a diameter of about 47 mm in 10 to 12 days at 25°C (Fig C-50); about 40 mm at 30 C; seldom growing at 37°C; (growing very well on NO_3-medium); smooth and central area commonly raised, typically fasciculate, becoming developing coremia, with a white margin about 0.2 to 0.5 mm wide, conidial areas in bluish green shades near Bluish Gray Green shades in marginal areas and Dark Yellowish Green shades in central areas, becoming to Dark Russian Green and Leaf Green, exudate lacking or very limited, yellowish color; odor fragrant, suggesting perfume, variously diagnosed as lavender or lilac; reverse dull yellow shades, with surrounding agar colorless, penicilli asymmetric and biverticillate, comparatively long, usually consisting of the main axis 1 to 3 branches variously produced at the upper nodes of the stalk (Fig M-50); conidiophores arising from the substratum or occasionally from superficial hyphae on or near the agar surface, variable in length up to 120 to 300 μ by 3.5 to 4.8 μ, with apices somewhat enlarged up to 4.2 to 5.5 μ, with walls smooth or nearly so, branches variable, mostly 14 to 27 μ by 3.0 to 4.5 μ, apices 4.0 to 5.5 μ; metulae commonly 2 to 4 in the verticils, loosely compact, variable, about 14 to 22 μ by 3.0 to 4.2 μ, sterigmata usually in cluster of 4 to 6, loosely compact, measuring 8.3 to 12.4 μ by 2.7 to 3.5 μ, conidia typical cylindrical, mostly 3.4 to 5.8 μ by 2.8 to 3.7 μ, occasionally larger up 5.0 to 8.7 μ by 3.1 to 3.8 μ, with walls smooth or nearly so, and the slightly rough walls are shown by electron microscopy (Fig E-50), conidial chains tangled or loosely parallel, up to 60 to 180 μ in length

Colonies on steep agar growing more rapidly than on Czapek, about 64 mm in 10 to 12 days at 25 C, about 68 mm at 30 C, seldom growing at 37 C, conidial areas darker blue-green shades near Russian Green, the other characters as on Czapek

Strains of this species isolated from soils and diseased fruits

*Wehmer C Beitz Kennth Einh Pilze, II pp 69 72 Taf I fig 1 3 Taf II figs 1 19, Jena 1895

**Thom C The Penicillia pp 412 414 fig 63 1930

***Raper K B Thom, C and Fennell D I A Manual of the Penicillia pp 526 529 1949

****Abe, S J Gen Appl Microbiology 114 115 1956

51. *Penicillium corymbiferum* Westling



Fig. M-51 A. *Penicillium corymbiferum* Westling, FAT 606, low power view of colony section showing typically coremia.

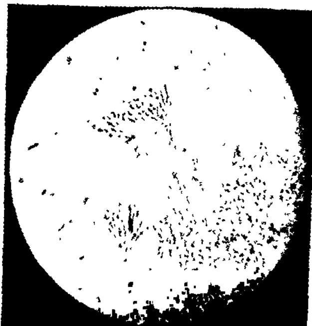


Fig. M-51 B. *Penicillium corymbiferum* Westling, FAT 606, detail of penicilli.

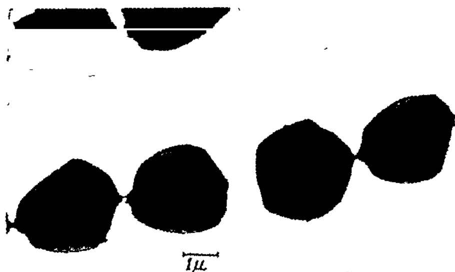


Fig. E-51 *Penicillium corymbiferum* Westling, FAT 606, conidia showing the slightly rough walls and the globose to subglobose form.

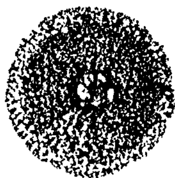


Fig. C-51. *Penicillium corymbiferum* Westling, FAT 606, on Czapek agar, 10 days

ツアペック寒天培養における集落の発育は25°Cにて5日目約25 mm，10日目約42 mm，20日目約70 mm，30°C 10日目約23 mm；37°C 発育不能，集落表面は粗雑な顆粒状又は畝状外観で分生胞子柄が集落円周部にては容易に見分けのつく束状に集合し，菌叢は束状で粘束系状（Fig C-51），平滑又は僅小な輪層状発育を示し，集落円周部は束状，顆粒状外観を呈し，白色，約1.5 mm 巾，分生胞子着生部は黄緑色調，順次帯黄緑色，又は濃黄緑色調を呈す；滲出物は豊富，無色又は黄色調，集落裏面は黄又は黄褐色調，順次桃，又は褐色調を呈し，集落周辺培地は無色，ペニシラスは不整斉輪生状，比較的大型（Fig M 51），分生胞子柄は長さ変化にとみ，60～500 μ～以上×4.0～5.8 μ，頂端部 4.6～6.2 μ，顆粒状粗面，分枝は屢々再分岐し，変化に富み，11～30 μ×4.0～5.6 μ，梗基は3～5ヶ輪生状様に群生，9.3～15.6 μ×3.1～4.3 μ，頂端部 3.7～5.0 μ，梗子3～7ヶ並行状様に着生，8.7～10.6×2.1～3.0 μ，分生胞子球形又は亜球形，2.5～3.5 μ，滑面，又電子顕微鏡写真（Fig E-51）にては0.1 μ以下の僅小粗面，分生胞子連鎖は縺状，長さ 120～250 μ

ステープ寒天培養における集落の発育は25°Cにて5日目約27 mm　10日目約73 mm，20日目約74 mm，30°C 10日目約30 mm，37°C 発育不能，集落裏面は一層濃厚色，他の諸特性はツアペック同様。

亜硝酸塩寒天培養においては特異的に発育す能

本菌株は土壌又は球根より分離さる

51 *Penicillium corymbiferum* Westling

Colonies on Czapek agar growing rather rapidly spreading, attaining a diameter of about 42 mm. *in 10 to 12 days at 25°C; about 23 mm. at 30°C;* seldom growing at 37°C; (growing little or not on NO_2-medium), typically fasciculate and abundant coremia with colony surface appearing coarsely granular or ridged and with the majority of conidiophores aggregated into clearly defined bundles easily viewed at the colony margin (Fig. C-51), smooth and slightly zonate, with growing margin fascicle, granular appearing, white about 1.5 mm. wide, conidial areas yellow-green shades near Deep Dull Yellow Green, becoming Empire Green or Dark American Green; exudate abundantly, colorless or yellowish colors, odor variable, generally not pronounced, reverse yellow or yellow-brown shades, becoming pinkish or brownish shades, with surrounding agar colorless; penicilli asymmetrical and biverticillate, comparatively large (Fig M 51); conidiophores variable in length, 60 to 500 μ or more by 4.0 to 5.8 μ, with apices somewhat enlarged up to 4.6 to 6.2 μ in diameter, with granular walled, branches occasionally rebranched, variable, commonly 11 to 30 μ by 4.0 to 5.6 μ, metulae in groups of 3 to 5, loosely compact, measuring 9.3 to 15.6 μ by 3.1 to 4.3 μ, with apices 3.7 to 5.0 μ, sterigmata loosely parallel verticils of 3 to 7, mostly 8.7 to 10.6 μ by by 2.1 to 3.0 μ, conidia globose to subglobose, mostly 2.5 to 3.5 μ, with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E 51), conidial chains tangled, up to 120 to 160 μ in length

Colonies on steep agar growing more rapidly than on Czapek, about 73 mm in 10 to 12 days at 25°C, about 30 mm at 30°C, seldom growing at 37°C, typically radially furrowed; colors in colony reverse generally in duller shades, the other characters as Czapek

Strains of this species isolated form the soils and liliaceous bulbs and root crops

*Westling G., Arkiv for Botanik 11 56, 92 95, figs 16, 58 1911

**Thom C. The Penicillia pp 423 425 1930

***Raper K. B. Thom C. and Fennell D. I., A Manual of the Penicillia pp 540 544 1949

****Abe, S. J. Gen. Appl. Microbiology 1 15 1956

52. *Penicillium claviforme* Bainier



Fig. M-52 A. *Penicillium claviforme* Bainier, FAT 1266, enlarged view of a single coremium.

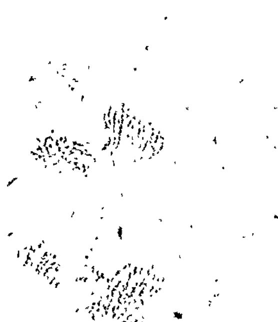


Fig. M-52 B. *Penicillium claviforme* Bainier, FAT 1266, detail of penicilli

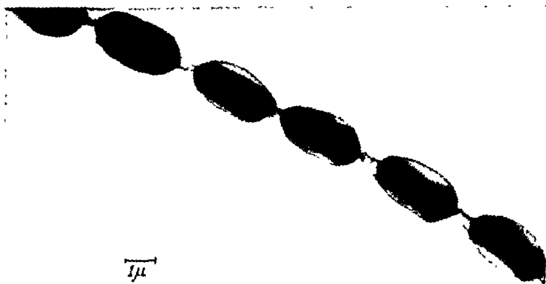


Fig. E-52. *Penicillium claviforme* Bainier, FAT 12-6, conidia showing the smooth or nearly so walls and the elliptical or ovate form

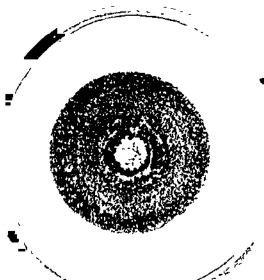


Fig C-52 A. *Penicillium claviforme* Bainier, FAT 1266, on Czapek agar, 10 days

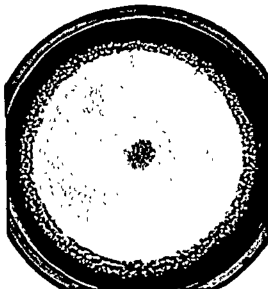


Fig. C-52 B. *Penicillium claviforme* Bainier, FAT 1266, on Czapek agar, 20 days.

ツァペック寒天培養：集落の発育は 25°C にて5日目 22~38 mm；10日目 57~68 mm (Fig C-52 A)，20日目 65~73 mm (Fig. C-52 B)；30°C，10日目 26~48 mm；37°C，発育不能．集落表面は輪生状に発育し，菌叢は著しい束状又は結束糸状で，結束糸 (Coremium) は恰もゴルフのクラブの形状をなし，百数拾本或はそれ以上の分生胞子柄が束状 (Fig. M-52 A) を呈し，その先端附近にペニシラス (Penicillus) が着生す，高さは 2~3 mm 或は屡々 1 cm 又はそれ以上，殆んど単一分生胞子柄は生じない，胞子着生部の呈色はやゝ濃い青緑色又は黄緑色；滲出物は豊富又は僅小で無色；集落裏面はオレンジ色又は褐色を呈し，結束糸の下部は一層着色が強い，集落周辺寒天は淡黄色で順次薄褐色に移行，ペニシラス (Penicillus) は分岐不整斉状 (Asymmetrical Biverticillate) で分枝か数段階に分岐し，且つ大型 (Fig M-52 B)，分生胞子柄は結束糸 (Coremia) 状に生育，単一直立は僅少，250~700 μ 以上×3.2~5.2 μ，平滑，先端やや膨大し40~58 μ，分枝は各種着生状を示し，90~30 μ×28~40 μ，基底梗子，2~4ヶ，幾分か拡散又は多少散開状に群生，84~13 μ×25~36 μ；梗子，2~5ヶ幾分か拡散に群生，91~12 μ×20~29 μ，分生胞子，楕円又は卵形 28~38 μ×2.2×31 μ，平滑，電子顕微鏡写真にても平滑 (Fig E 52)，分生胞子連鎖は巾広い塔状（円柱状）又は並行状 60~120 μ 以上

スタイナア天培地　集落は 25°C，10日目 75~80 mm，30°C，27~52 mm，37°C，発育不能，他の諸特性は同上。

亜硝酸寒天培地にては特長的に発育不能。

本菌種は屡々各種土壌，蜜柑，オレンジ類，空気中，昆虫より分離される。

52. *Penicillium claviforme Bainier*

Colonies on Czapek agar growing broadly, attaining a diameter of 57 to 68 mm in 10 to 12 days at 25°C (Fig C-52 A and B), 26 to 48 mm

variously branched commonly measuring 2 to 3 mm in height but occasionally up to 1 cm or

produced colorless, reverse orange or brown, darker directly beneath the coremia, with surrounding agar pale yellow, becoming similar or pale brown, penicilli biverticillate and asymmetrical, very irregular and often larger (Fig M-52B); conidiophores poorly defined, with walls smooth

parallel, up to 60 to 120 μ or more in length

*Bainier, O, Bul Soc Mycol France 21 127, Pl XI, figs 8 11 1905

**Thom, C U S Dept Agr, Bur Anim Ind, Bul. 118, p 44 fig 10 1910, The Penicillia, pp 432 433, fig 68 1930

***Raper K B Thom, C and Fennell, D I, A Manual of the Penicillia pp 549 553 1949

****Abe, S J Gen Appl Microbiology p 116 1956.

53. *Penicillium clavigerum* Demelius.

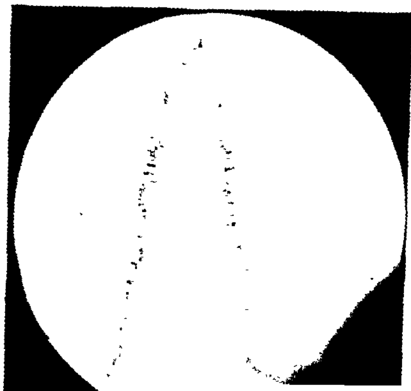


Fig. M-53. *Penicillium clavigerum* Demelius, FAT 1161, detail of a single coremium.

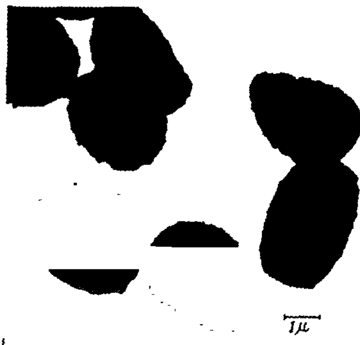


Fig. [illegible]-53. *Penicillium clavigerum* Demelius, FAT 1161, conidia showing the slightly rough walls and the typically

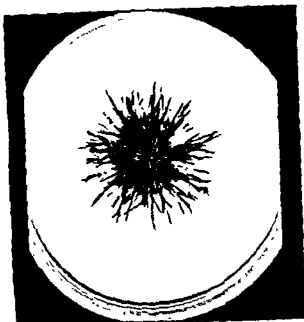


Fig C-53, *Penicillium clavigerum* Demelius, FAT 1161, on Czpek agar, 10 days.

ツァペック氏人培養における集落の発育は 25 C にて 5 日目約 18 mm、10 日目約 35 mm、20 日目約 60 mm; 30 C 10 日目約 35 mm; 37°C 発育不能。菌叢は集落全面結束糸状; (Fig C-53) 図の如くその結束糸 (coremia) は長さ 2~10 mm の各種で、単一結束糸は恰も針の如き形状、頂端部は尖り、ペニシラスは中間部に多く着生、クラブ (ゴルフ使用の) 状は呈さぬ、菌糸は白又は黄色、分生胞子着生部は黄緑色調 順次同色又はくすんだオリーブ緑色を呈す、滲出物は僅少、黄色調、集落裏面は黄色調、順次、桃褐色調 集落周辺寒天は無色、順次黄色色調; ペニシラスは不整斉輪生状、主軸上に1又は2ケの分枝を有し、時には梗基細胞の群生のみの場合もある (Fig M-53)、分生胞子柄は長さ各種、2~10 mm × 2 8~4,1 μ、頂端球膨大、3 7~4 4 μ、滑面、分枝 6 2~15 6 × 2 5~3 5 μ、梗基細胞 2~4 ケ、緻密状、又は幾分か散開状様に着生 7 5~12 5 μ × 2 5~3 5 μ、頂端部 3 1~4 1 μ、梗子 2~4 ケ緻密状様に着生、9 3~12 5 μ × 2 0~2 5 μ 対称斉輪生状と思わしめる如き、先端が順次尖る、分生胞子は楕円、3 4~4 4 μ × 2 6~3 5 μ、滑面、又電子顕微鏡写真 (Fig E 53) にても 0 1 μ 以下の僅少な粗面、分生胞子連鎖は錯状、又は円柱状様、長さ 30~120 μ

スティープ氏人培養における集落の発育は 25 C にて 5 日目約 22 mm; 10 日目約 47 mm 20 日目約 60 mm、集落裏面は暗褐色、順次黒色調を呈す、ペニシラスは一層複雑な分枝を示し、他の諸性質は上記同一様

硝酸塩を人培養においてはノアペック氏人同様良好なる発育を示す。

本菌種は土壌より分離さる。

53 *Penicillium clavigerum* demelius

Colonies on Czapek agar growing somewhat restrictedly, attaining a diameter of about 35 mm in 10 to 12 days at 25°C, about 35 mm at 30 C, seldom growing at 37 C, (growing very well on NO_2-medium), very strongly fasciculate throughout with the coremiform aspect dominating the entire colony, coremia Isaria like, simple (Fig C-53), rounded or more or less flatened and even spray-
-- oble
om-
ices
usually pointed and with penicilli more concen-
trated in terminal portions, but generally borne over their entire length, coremia seldom clavate and rarely showing a clear differentiation into stalk and spore bearing areas, white at first but developing yellow green shades near American Green, becoming similar or Slate Olive, exudate limitedly, dull yellow colored, odor pronounced, moldy, reverse yellow shades, becoming pinkish brown shades, with surrounding agar colorless, becoming yellow shades, penicilli abundantly pro-duced, asymmetric, commonly showing one or two branches in addition to the main axis, but in frequently bearing a single terminal verticil of metulae (Fig M-53), conidiophores variable in length, mostly very long up to several milimeters, about 2 to 10mm by 2 8 to 4 1 μ, apices somewhat enlarged up to 3 7 to 4 4 μ, with smooth or nearly so walled, branches mostly 6 2 to 15 6 μ by 2 5 to 3 5 μ, metulae usually in groups of 2 to 4, loosely compact or somewhat divergent, measuring 7 5 to 12 5 μ by 2 5 to 3 5 μ, apices 3 1 to 4 1 μ, sterigmata loosely compact, commonly borne in cluster of 2 to 4, mostly 9 3 to 12 5 μ by 2.0 to 2 5 μ, gradually tapered to conidium bearing tips in a manner suggestive of the Biverticillate Symmetrica, con idia typically elliptical, 3 4 to 4 4 μ by 2 6 to 3 5 μ, with smooth or nearly so walled, and the slightly rough walls are shown by electron micro-scopy (Fig E 53), conidial chains loosely tangled or column up to 30 to 120 μ in length

Colonies on steep agar growing more rapidly than on Czapek about 47 mm in 10 to 12 days at 25 C, about 45 mm at 30 C, seldom growing at 37 C, reverse in dark walnut to almost black shades, penicilli with parts generally as described above but usually more complexly branched, the other characters as on Czapek

Strains of this species isolated from soils

*Demelius P Verhandl Zool Bot Gesellsch Wein 72 74 75 fig 4 1923

**Thom C The Penicillia p 427 1930

***Raper K B Thom C and Fennell D I A Manual of the Penicillia pp 553 555 1949

****Abe S J Gen Appl Microbiology 1 1? 1956

54. *Penicillium wortmanni* Klocker.

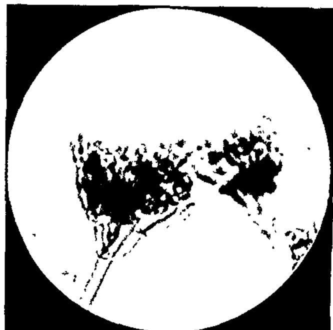


Fig. M-54A. *Penicillium wortmanni* Klocker, FAT 361, detail of a single penicillus

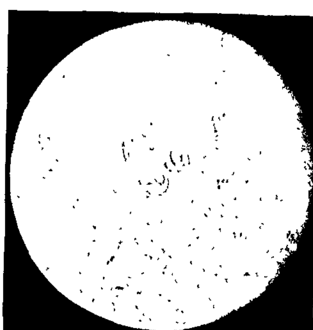


Fig. M-54B. *Penicillium wortmanni* Klocker, FAT 361 two ascus contains ascospores

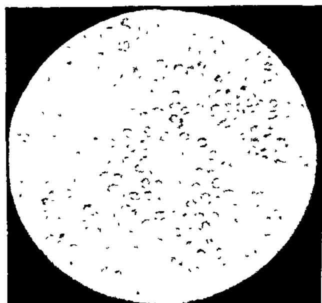


Fig. M-54C. *Pen[illegible]* *wortmanni* Klocker FAT 361, [illegible] mature ascospores



Fig. E-54. *Penicillium wortmanni* Klocker, FAT 361 conidia showing the slightly rough walls and the elliptical or lemon form with ends [illegible] more or less pointed



Fig C-54 *Penicillium wortmanni* Klocker, FAT 364, on Czapek agar, 10 days.

ツァペック寒天培養に於ける集落の発育は 25°C にて 5 日目約 18 mm, 10 日目約 30 mm, 20 日目約 67 mm, 30°C 10 日目約 35 mm, 37°C 10 日目約 12 mm, 各菌株にて着色及び菌叢は各種, 一般的に僅小な綿毛状又は縄状て硬い菌糸帯を有す, 放射状様の皺があり, 集落円周部は約 0 5 mm 巾白色; 中心部にては黄色菌糸と青緑又は黄緑色分生胞子体とが輪層状又は共に発育, 又或る菌株にては分生胞子を豊富に作り, 又他菌株にては分生胞子が僅小か又は作らず, 順次黄橙色調, 滲出物は欠又は僅小; 集落裏面は桃橙色又は褐桃色調集落周辺寒天は無色, ペニシラスは整斉輪生状 (Fig M 54 A), 分生胞子柄は基質より生育し, 30~130 μ~以上×2 5~3 2 μ, 頂端部は幾分か膨大, 3 1~4 3 μ, 滑面, 基底梗子は緻密状に 4~7 ケ群生し, 9 3~12 5 μ×2 3~3.0 μ, 梗子 4~7 ケ近接並行状に叢生, 10~12 5 μ×1.8~2 4 μ, 箭鋒状て先端尖る, 分生胞子は楕円又はレモン形で多少端が細い, 2 8~3 4 μ×1 8~2 5 μ, 滑面, 電子顕微鏡写真 (Fig E-54) にては 0 1 μ 以下の僅小粗面, 分生胞子連鎖は緩状, 長さ 60~95 μ, 被子器は僅小又は豊富に約 20 日目には形成 (Fig C-54), そのサイズは各種, 楕円又は亜球形, 一般に 240~700 μ×190~500 μ, 黄色調菌糸にて覆われ, (asci) 子嚢は卵形, 又は亜球形, 8~12 μ (Fig M-54 B) 8 ケ, (ascopore) 子嚢胞子を有す, 子嚢胞子は楕円, 小刺状粗面, 3 4~5 6 μ×2 8~3 7 μ (Fig. M 54 C), 無色,

ステープ寒天培養にては 25°C にて 5 日目約 22 mm, 10 日目約 34 mm, 20 日目約 76 mm; 30°C 10 日目約 40 mm; 37°C 10 日目約 14 mm, 他の諸特性は上記同一様,

本菌株は土壌又は塵芥より分離さる。

54. *Penicillium wortmanni* Klocker

Colonies on Czapek agar growing rather restrictedly, attaining a diameter of about 30 mm in 10 to 12 days at 25°C, about 35 mm at 30°C, seldom growing at 37 C; (growing fairly well on NO_2-medium), varying markedly in color and texture depending upon the individual strain, commonly consisting of a tough mycelial felt with surface often appearing slightly floccose or funiculose, loosely radial furrowed, with growing margin white, about 0 5 mm wide, and with central areas showing zones of either yellow mycelium or blue-green, yellow green conidial heads, or both, in some strains producing abundant conidia, in others showing few or no conidial heads and usually becoming yellow-orange, exudate lakcing or limitedly, clear; odor suggesting of mushrooms; reverse in pinkish orange to tawny shades, with surrounding agar colorless, penicilli typically biverticillate and symmetrical (Fig M 54A), conidiophores arising primarily from the substratum, up to 30 to 130 μ or more by 2.5 to 3 2 μ, with apices somewhat enlarged up to 3 1 to 4 3 μ, with smooth or nearly so walled; metulae in compact verticils of 4 to 7, about 9 3 to 12 5 μ by 2 3 to 3 0 μ, sterigmata closely parallel, in clusters of 4 to 7, mostly 10 to 12 5 μ by 1 8 to 2 4 μ lanceolate with the terminal portion characteristically tapered, *conidia elliptical or lemon form with ends commonly* more or less pointed, mostly 2.8 to 3 4 μ by 1 8 to 2 5 μ, with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-54); conidial chains loosely tangled, up to about 60 to 95 μ in length, perithecia produced in limited or abundantly (Fig C 54) in about 20 days, varying greatly in dimensions, elliptical or subglobose, commonly 240 to 700 μ by 190 to 500 μ, surrounded by loose mantles of heavily encrusted ahd strongly yellow pigmented hyphae, asci abundantly produced throughout a loose hyphal network, borne in short chains, oval to sub-sherical, about 8 to 12 μ in diameter, 8-spored (Fig M-54 B), ascospores elliptical, spinulose over their entire surface (Fig M 54C), mostly 3 4 to 5 6 μ by 2 8 to 3 7 μ, colorless or nearly so

Colonies on steep agar growing restrictedly, adout 34 mm in 10 to 12 days at 25 ; about 40 mm at 30 C, *about 14 mm at 37 C, the other* characters as on Czapek

Strains of this species isolated from soils and dusts

*Klocker A, Compt Rend Lab Carlsberg 6 100 1903

**Biourge Ph Monograph La Cellule 33 fasc 1 pp 243 244 1923

***Thom C The Penicillia pp 419-430 1930 mycologia 27 133 135, fig 1 1935

****Raper K B Thom C and Fennell D I A Manual of the Penicillia, pp 593 596 1949

*****Abe, S J Gen Appl Microbiology P 118 1956

55. *Penicillium duclauxi* Delacroix



Fig. M-55 A. *Penicillium duclauxi* Delacroix, 1293, low power view of colony section showing typical coremia.

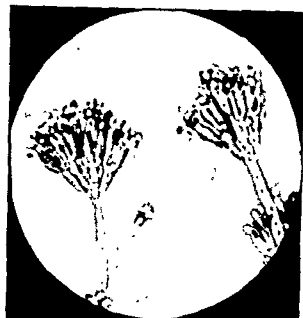


Fig. M 55 B. *Penicillium duclauxi* Delacroix, FAT 1293, detail of penicilli



Fig. E-55. *Peni[illegible] duclauxi* Delacroix, FAT 12[illegible], conidia showing the slightly rough walls and the [illegible]



Fig C-55. *Penicillium duclauxi*, Delacroix, FAT 1293, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C にて5日目約 15 mm；10 日目約 32 mm (Fig C-55), 20 日目約 70 mm，30°C, 10 日目 28 mm；37°C, 約 3 mm；菌叢は著しい束状で 1～15 mm の高さの結束糸状，放射状の皺を有し，薄黄，薄黄緑，薄橙，赤色調の菌糸が塊，又は絨状に発育，分生胞子着生部は濃黄緑色調，順次オリーブ黒色を呈す，滲出物は欠又は僅小，無色又はくすんだ黄或は薄褐色調，集落裏面は最初は黄色，次に橙褐，橙赤色，順次赤色又は褐色調，集落周辺寒天は上記同様薄色調に着色；分生胞子柄は結束糸又は気菌糸の絨状に生育，一般的に基質より直立しているのは無い，200～300 μ 以上×31～42 μ，頂端部は，37～43 μ，滑面，ペニシラスは整斉輪生状で，梢状の梗子の着生を持つ基底梗子の単一群生を有す (Fig M 55)，時々断片的に再分岐が幾分か一方的に現われる，基底梗子は緻密な並行状に 4～6ヶ群生 106～137 μ×28～37 μ；梗子は緻密な並行状に 3～6 ヶ着生，110～125 μ×21～27 μ；分生胞子は楕円又は紡錘形，31～41 μ×21～30 μ，滑面，電子顕微鏡写真 (Fig E-55) にては 01 μ 以下の僅小粗面，分生胞子連鎖は並行状又は鎖状様，長さ 120～200 μ

ステイープ八大培養に於ける集落の発育は 25°C にて5日目約 28 mm；10 日目約 45 mm；20 日目約 70 mm，30°C, 10 日目約 42 mm，37°C, 10 日目約 3 mm，他の諸特性は上記同一様。

亜硝酸曹達寒天培養に於ける発育はツァペック寒天同様に良好

本菌株は土壌又は腐敗物より分離さる。

55 *Penicillium duc'au* [illegible]

Colonies on Czapek [illegible] rictedly, attaining a [illegible] 10 to 12 days at 25 [illegible] at 30 C, about 3 m [illegible] very well on NO [illegible] ly tough basal [illegible] fascicles, mostly [illegible] radial furrowed [illegible] nantly in pale yel[illegible] or reddish shades [illegible] dant masses and [illegible] mycelium, conid[illegible] near Dull Black[illegible] Olivaceous Blac[illegible] colorless or dull yel[illegible] odor limited, [illegible] variously colored [illegible] brown or orange red [illegible] Brazil Red or brownish [illegible] agar similarly colore[illegible] phores arising primar[illegible] aerial hyphae, less co[illegible] substratum, variable in [illegible] or more by 31 to 42 μ with [illegible] 43 μ, with smooth or nearly s[illegible], per[illegible] biverticillate and symmetrical consisting of a single terminal verticil of metulae (Fig M 55) [illegible]

pattern of the group, metulae usually in verticils of 4 to 6, closely parallel, measuring 106 to 137 μ by 28 to 37 μ sterigmata closely parallel, 3 to 6 [illegible]

and the slightly rough walls are shown by elec- [illegible]

on Czapek, about 45 mm in 10 to 12 days at 25°C; about 42 mm. at 30 C, about 3 mm at 37°C, the other characters similar as on Czapek

Strains of this species isolated from soils and deteriorating materials

*Klocker, A, Compt Rend Lab Carlsberg 6 100 1903

**Biourge, Ph, Monograph La Cellule 33 fasc 1 pp 243 244 1923

***Thom, C, The Penicillia, pp 449 450 1930 Mycologia 27 133 135, fig 1 1935

****Raper, K B, Thom, C, and Fennell D I, A Manual of the Penicillia, pp 583 586 1949

*****Abe, S, J Gen Appl Microbiology 118 1956

56. *Penicillium funiculosum* Thom

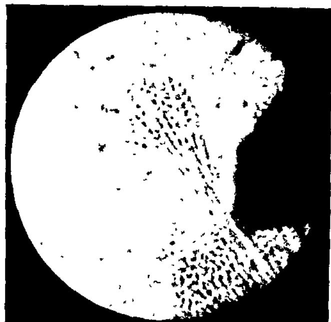


Fig. M-56 A. *Penicillium funiculosum* Thom, FAT 71, detail of a single penicillus

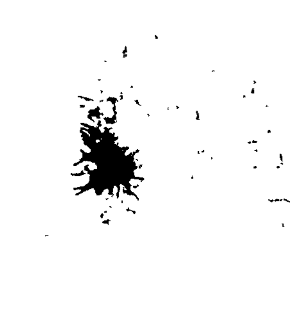


Fig. M-56 B. *Penicillium funiculosum* Thom, FAT 71, low power view of colony section showing typical funiculose character of texture.



Fig. M-56 C. *Penicillium funiculosum* Thom, FAT 71, low power view of loosely parallel or tangled conidial chains

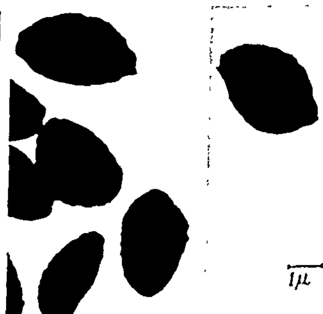


Fig. M-56 E. *Penicillium funiculosum* Thom, FAT 71 conidia showing the slightly rough walls and [illegible] fusiform or elliptical form

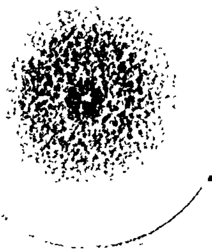


Fig. C-56. *Penicillium funiculosum* Thom, FAT 71, on Czapek agar, 10 days

ツアペック寒天培養に於ける集落の発育は25°Cにて5日目20〜22 mm, 10日目63〜70 mm (Fig C-56), 20日目76〜80 mm, 30°C 10日目70〜72 mm, 37 C, 5〜10 mm; 菌叢は縄状, 平滑, 輪層帯状発育をし; 栄養菌糸と分生胞子構成体及び下層寒天の着色の相対的量にて各種に呈色, 或る菌株にては無色, 桃, 淡桃褐色調に, 又他菌株にては黄, 赤色調に気菌糸が着色す; 集落周囲部は白色又は淡黄色, 約5 mm 巾; 分生胞子着生部は中心部又は近円周部に多く, 暗黄緑色様色調, 順次暗オリーブ緑色又は褐灰オリーブ色を呈す, その呈色は屡々着色菌糸にて不明瞭になる, 滲出物は欠, 又は僅小, 或は豊富, 無色又は淡黄色調; 集落裏面は変化に富み, 集落近円周部は無色から黄色調, 中心部は赤色, 赤紫色調, 順次紫赤褐色調を呈す; 集落周辺寒天は常に無色; 分生胞子柄は縄状菌糸より直角に生育, 屡々短く, 時に円周部にては基質より直立す, 60〜120 μ 以上×2 5〜3 4 μ, 頂端部 3 1〜4 1 μ, 滑面, ペニシラスは整斉輪生状で, 基底梗子の群生を有し, 屡々長さが違い, 時には梗子の下で基底梗子が再分岐する場合もある (Fig M 56), 基底梗子は緊密な並行状に4〜6ケ群生し, 8 3〜12 5 μ×2 3〜3 0 μ, 梗子は緊密な並行状に4〜6ケ着生し, 10〜12 5 μ×1 5〜2 5 μ, 槍状, 分生胞子は紡錘形又は楕円形, 3 1〜3 7 μ×2 1〜2 6 μ, 滑面, 電子顕微鏡写真 (Fig E 56) にては0 1 μ以下の僅小な粗面; 分生胞子連鎖は並行状又は錯綜状, 長さ 60〜120 μ

スティープ寒天培養にては 25 C にて5日目 22〜30 mm 10日目 66〜74 mm 20日目 80 mm, 30 C 10日目 70〜73 mm, 37 C 10日目 5〜8 mm, 通常分生胞子着生多く且著しい縄状菌叢, 集落裏面は赤色調ではなく橙褐色調, 集落円周部は約 15 mm 巾, 他の諸特性は上記同一様

亜硝酸ソーダ寒天培養にては特異的に発育不能

本菌種は土壌又は腐敗物より分離さる。

56. *Penicillium funiculosum* Thom

Colonies on Czapek agar growing broadly, commonly 63 to 70mm in 10 to 12 days at 25°C (Fig C-56), 70 to 72 mm at 37 C; about 5 to 10 mm at 37°C; (growing characteristically little or not on NO_2-medium), typically funiculose, smooth, zonate, variable in color depending upon the relative amounts of vegetative mycelium and conidial structures and the pigmentation of the underlaying agar, in some strains white to pink or flesh shades, in others developing yellow to orange or red colors with some encrustment of aerial hyphae, with margin about 5 mm, white or pale yellow color; sporulating irregularly, often heaviest in central and marginal colony areas, conidial areas in yellow green shades near Dull Blackish Green, becoming Dusky Olive Green to Slate Olive, but with colors of conidial areas often altered or obscured by pigmented hypahe, exudate lacking, limited or abundantly colorless or pale yellow colors; odor lacking or mold, slightly earthy, reverse variable, marginal areas colorless becoming yellow shades, central areas near Brazil Red, Pansy Purple, becoming Hessian Brown Shades, with surrounding agar usually conidiophores arising mainly at right angles from funiculose hyphae, often very short, in marginal areas sometimes arising directly from the substratum, ranging from 60 to 120 μ or more by 2 5 to 3 4 μ, with apices somewhat enlarged up to 3 1 to 4 1 μ with smooth or nearly so walled, penicilli typically biverticillate and symmetrical, usually consisting of a single terminal verticil of metulae, often of different lengths, not infrequently showing individual metulae rebranched below the level of the sterigmata (Fig M 56), metulae mostly 4 to 6 in the verticil, closely parallel, about 8 3 to 12 5 μ by 2 3 to 3 0 μ, sterigmata mostly in verticils of 4 to 6 closely parallel, about 10 to 12 5 μ by 1 5 to 2 5 μ, with lanceolate type, conidia fusiform or elliptical,mostly 3 1 to 3 7 by 2 1 to 2 6 μ, with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-56), conidial chains loosely parallel to tangled, up to 60 to 260 μ in length

Colonies on steep agar growing about 66 to 74 mm in 10 to 12 days at 25 C, about 70 to 73 mm at 30 C, about 5 to 8 mm at 37 C, usually heavier sporing and more conspicuously funiculose, reverse usually showing less red, commonly in orange brown shades, margin about 15 mm wide, the other characters as on Czapek

Strains of this species isolated from soils and deteriorating materials

*Thom C, U Dept Agr Bur Anim Ind Bul 118 p 69 fig 27 1910, The Penicillia pp 464 465 fig 77 1930

**Raper K B Thom C and Fennell D I A Manual of the Penicillia 616 621 1949

. . S, J Gen Appl Microbiology 113 1956

57. *Penicillium islandicum* Sopp



Fig. M-57 A. *Penicillium islandicum* Sopp, FAT 946, detail of penicilli



Fig. M-57 B. *Penicillium islandicum* Sopp, FAT 946 detail of a single penicillus

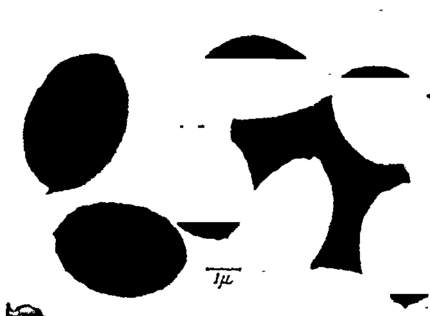


Fig. L-57. *Penicillium islandicum* Sopp, FAT 12[illegible]0, conidia showing the smooth or nearly so walls and the fusiform or elliptical form

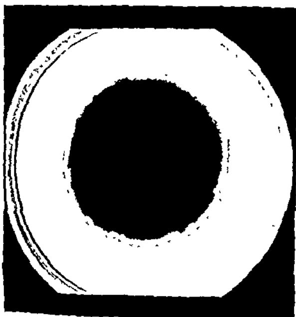


Fig. C-57. *Penicillium islandicum* Sopp, FAT 946, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C にて5日目 16～18 mm, 10 日目 20～34 mm, 20 日目 46～65 mm; 30°C, 10 日目 27～37 mm; 37°C 18～23 mm; 顕著なる輪紋状発育を示し，又放射状の皺を有す，菌叢は縄状，集落表面は橙，赤橙色調の菌糸と分生胞子構成体とが部分的に又は交互の帯をなし，集落周縁部は黄，橙，又は桃橙色調，0 2～0.5 mm，巾 (Fig C 57)，分生胞子着生部は暗濃黄緑色調，暗灰緑色調又は黄オリーブ色調を呈す，滲出物は僅少又は多量，橙又は橙赤色或は橙褐色調；集落裏面は橙褐色或は赤色調；集落周辺寒天は橙，赤色或は黄色調着色；分生胞子柄は短く気菌糸又は縄状菌糸或は時には基質より生育し，20～120 μ×2 3～3 0 μ，頂端部 2 5～3 7 μ，滑面；ペニシラスは基底梗子の緻密な群生を有し，時には再分枝しているが，整斉輪生状構成を示し，時には分生胞子柄の下部にて第二の群生を有する場合もある (Fig M-57)，基底梗子は緻密状又は幾分か散開形状に 5～8 ヶ群生し，7 5～11.2 μ×2 1～3 1 μ，梗子は並行状様に 3～6 ヶ着生，6 8～10 6 μ×2 1～2 8 μ，槍状，分生胞子は精円形又は楕円形，3 0～4 4 μ×2.3～3 7 μ，滑面，又電子顕微鏡写真 (Fig E-57) にても滑面；分生胞子連鎖は縦状，長さ 60～90 μ

スティープ寒天培養に於ける集落の発育は 25 C にて5日目 17～19 mm 10 日目 26～35 mm 20 日目 59～68 mm，30°C 10 日目 35～44 mm，37 C，25～29 mm；他の諸特性は上記同一様，亜硝酸塩寒天培養に於ける発育は特徴的に不能 本菌種は土壌又は病変米等より分離さる

57. *Penicillium islandicum* Sopp

Colonies on Czapek agar growing slow growing, attaining a diameter of about 20 to 34 mm in 10 to 12 days at 25°C, 27 to 37 mm at 30°C; 18 to 23 mm at 37°C; (characteristically growing little or not on NO_2-medium), conspicuously zonate, lightly wrinkled in a radial pattern, typical funiculose, consisting of a fairly tough felt of orange to red-orange encrusted mycelium from which arise ascending or funiculose hyphae bearing the conidiophores as short branches, with alternate zones or localized areas in which sterile hyphae or conidial structures dominate the colony surface, with yellow, orange or pinkish orange margin about 0 2 to 0 5 mm. wide (Fig. C-57); conidial areas dark yellow green shades near Dull Blackish Green or Dusky Dull Green, becoming similar shades or Yellowish Olive, exudate limited to fairly abundant, orange or orange red and orange-brown shades, odor indefinite to rather sharp, difficult to characterize, reverse in orange brown or reddish shades, with surrounding agar orange, reddish or yellow colors pigmented; conidiophores short, arising from aerial hyphae or ropes of hyphae and occasionally from the substratum, commonly 20 to 120μ by 2 3 to 3 0μ, with apices somewhat enlarged up to 2 5 to 3 7μ, with smooth or nearly so walled, penicilli usually consisting of a compact terminal verticil of metulae, not infrequently branched but with the branches also terminating in typical biverticillate-symmetrical structures, occasionally with a secondary verticil lower down on the conidiophore (Fig M 57), metulae 5 to 8 in the verticil, loosely compact or somewhat divergent, mostly 7 5 to 11 2μ by 2 1

Colonies on steep agar growing somewhat more rapidly, 26 to 35 mm in 10 to 12 days at 25 C, 35 to 44 mm at 30°C, 25 to 29 mm at 37 C, the other characters as on Czapek

Strains of this species isolated from soils and disease rices

*Sopp, O Monograph pp 161 164, Taf XVII, fig 122, Taf XXIII figs 25 and 26 1912

**Thom C The Penicillia pp 466-467 1930

***Raper K B Thom C and Fennell D I A Manual of the Penicillia pp 623 625 1949

****Abe S J Gen Appl Microbiology 119 120 1956

58. *Penicillium purpurogenum* Stoll

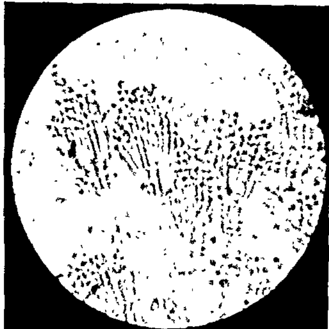


Fig. M-58 A. *Penicillium purpurogenum* Stoll. FAT 1211. detail of penicilli



Fig. M-58 B. *Penicillium purpurogenum* Stoll. FAT 1211. low power view of loosely parallel or tangled of conidial chains

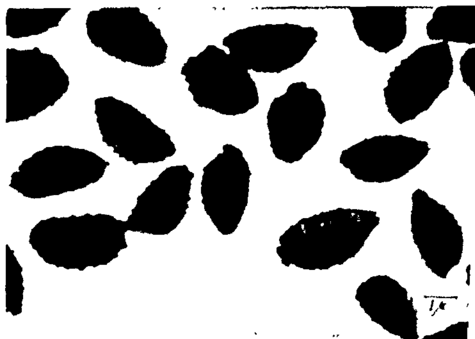


Fig. F-58. *Peni[illegible] purpurogenum* [illegible] rough walls and the [illegible]

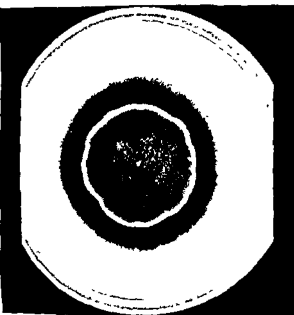


Fig. C-58 *Penicillium purpurogenum* Stoll, FAT 311, on Czapek agar, 10 days

ツアペック寒天培養に於ける集落の発育は 25°C 5日目, 6～18 mm, 10日目, 22～44 mm (Fig C-58), 20日目 35～75 mm; 30°C 10日目, 25～54 mm; 37°C 9～33 mm; 菌叢はビロード状又は類似, 或る菌株にては綿毛状になる傾向を有す, 平滑, 集落円周部は灰白, 黄, 橙, 橙赤, 桃色調, 巾約0.2～4.0 mm; 無色, 黄, 桃, 赤色調の気菌糸が僅少, 又は豊富, 分生胞子着生は中心部又は中間部に多く, 着生部は黄緑色調, 暗灰暗オリーブ緑色, オリーブ黒色, 等を呈す; 滲出物は欠又は僅少, 赤色調; 集落裏面は赤色或は紫赤調, 集落周辺寒天は同一色調又は多少淡色調赤色; 分生胞子柄は基質又は時には気菌糸より生育, 30～190μ×2.5～4.1μ, 頂端部は 3.3～6.3μ, 滑面又は僅小な顆粒状粗面, ペニシラスは整斉輪生状 (Fig M-58), 基底梗子は近接した並行状に 5～8 ヶ群生し, 9.3～14.2μ～18.8μ×2.0～4.7μ; 梗子は並行状に 4～8 ヶ着生し, 10～17.5μ×1.7～4.0μ, 槍状, 特長的に尖る, 分生胞子は楕円又は卵形, 2.3～3.8μ×1.6～3.2μ, 時には大型の 4.2～6.2μ×3.0～3.2μ, 滑面, 電子顕微鏡写真 (Fig E-58) にては僅小な粗面, 分生胞子連鎖は並行状又は錯状様, 長さ 30～180μ

ステイープ寒天培養に於ける集落の発育は 25°C にて5日目 12～31 mm, 10日目 25～55 mm, 20日目 38～80 mm; 30°C 10日目 27～69 mm, 37°C 4～40 mm; 他の諸特性は上記同一様 亜硝酸寒天培養にてはツアペック寒天同様良好なる発育を示す

本菌株は各種土壌, 果実類 (特に林檎), 病変米又他の腐敗物より屡々分離さる

58. *Penicillium purpurogenum* Stoll

Colonies on Czapek agar growing rather restrictedly, attaining a diameter of 22 to 44 mm in 10 to 12 days at 25°C (Fig C-58); 25 to 54 mm at 30°C; 9 to 33 mm at 37°C, *(growing very well on NO_2-medium), typical velvety or velutinous* some strains tending to become floccose, smooth with growing margin grayish white, yellow, orange red, pink shades, about 0.2 to 4.0 mm wide, colorless, yellow, pink, orange or reddish aerial mycelium limitedly or abundantly; usually heavily sporing in central and sub-central areas, in typical yellow-green shades near Dark Dull Yellow Green, Yew Green, Dull Blackish Green, becoming similar color or Dusky Olive Green, Olivaceous Black, Dark Ivy Green, exudate lacking or limitedly, typical reddish shades near Scarlet or Brazil Red, *odor indistinct or slightly moldy, reverse in* strongly red or purplish red shades, with surrounding agar similarly colored in somewhat lighter shades, conidiophores arising from the substratum or sometimes from aerial hyphae, 30 to 190μ by 2.5 to 4.1μ, with apices somewhat enlarged up to 3.3 to 6.3μ, with smooth or slightly granular walled, penicilli typically biverticillate and symmetrical, (Fig. M-58); metulae closely parallel, 5 to 8 in the verticil, mostly 9.3 to 14.2μ or 18.8μ by 2.0 to 4.7μ; sterigmata parallel, in clusters of 4 to 8, mostly 10 to 17.5μ by 1.7 to 4.0μ, lanceolate in form, characteristically tapered, conidia elliptical to ovate, 2.3 to 3.8μ by 1.6 to 3.2μ, occasionally larger 4.3 to 6.2μ to 3.0 to 3.2μ, with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-58), conidial chains loosely parallel or tangled, up to 30 to 180μ in length

Colonies on steep agar growing more rapidly than on Czapek, 25 to 55 mm in 10 to 12 days at 25°C, 27 to 69 mm. at 30°C, 4 to 40 mm at 37°C; the other characters similar as on Czapek

Strains of this species isolated from soils fruits (apples), diseased rice, and other deteriorating materials in nature

*Stoll O., Beitrage zur morphologischen und biologischen Charackteristrik Penicilliumarten, Wurzburg p 35 Taf I fig 7 Taf III, Fig 3 Taf IV fig 4 1904

**Thom, C U S Dept Agr., Bur Anim Ind Bul 118, p 39 fig 7 1910 and Mycologia 7 134 142 1915, The Penicillia, pp 478 479 1930

***Raper K B Thom C and Fennell D I, A Manual of the Penicillia pp 633-636 1949

****Abe, S J Gen Appl Microbiology 121 122 1956

59. ***Penicillium rubrum*** **Stoll**

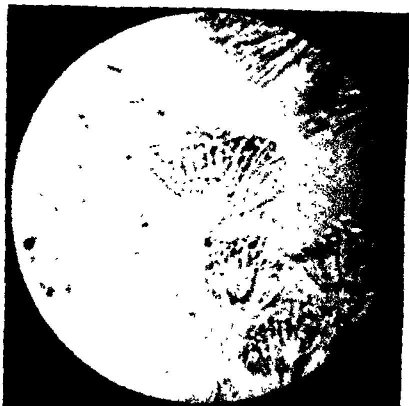


Fig. M-59. *Penicillium rubrum* Stoll, FAT 727, detail of a single penicillus



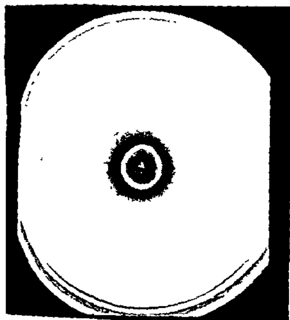


Fig. C-59 *Penicillium rubrum* Stoll, FAT 727, on Czapek agar, 10 days.

ツアペック寒天培養に於ける集落の発育は25°Cにて5日目3~7mm、10日目10~13mm、(Fig C-59)、20日目18~23mm；30°C 10日目10~14mm、37°C 約3mm，菌叢はビロード状、皺又は放射状の溝を有し、分生胞子構成体は集落全面に又は部分的に発育し、分生胞子無形成部又は僅小部分には無色、黄色、桃色調菌糸豊富、集落周縁部は白、黄色調、巾0.5~1.0mm；分生胞子着生部は黄緑、又は灰緑色調、略々同一様又は灰オリーブ色調を呈す。滲出物は豊富又は僅小、赤色又は鮮赤色調；集落裏面及周辺寒天は著しい赤色調に着色；分生胞子柄は基質又は時には匍匐又は気菌糸より生育し、100~190μ×2.0~4.5μ、頂端部3.0~5.3μ、滑面，ペニシラスは整斉輪生状(Fig M-59)，常に粗束状様又は散開状様の6~10ケの基底梗子を有す，8.3~12.5μ~14.3μ×2.0~4.0μ，梗子は特徴的な先端の尖った槍針状，5~8ケ粗束状様に着生，10~12.5μ×1.5~2.5μ，分生胞子は楕円、紡錘形又は卵形，2.5~3.7μ×1.5~3.1μ，滑面，電子顕微鏡写真(Fig E-59)には0.1μ以下の僅小粗面，分生胞子連鎖は並行状様又は散開状様，長さ40~100μ

ステイープ寒天培養に於ける発育は25°Cにて5日目約5~12mm，10日目7~28mm 20日目10~28mm，30°C 10日目4~30mm，37°C 10日目3~4mm；他の諸性質はCzに同一様。

亜硝酸塩寒天培養に於ては僅小な胞子形成をする程度の発育を示す。

本菌株は土壌又は腐敗物より分離さる

59 *Penicillium rubrum* Stoll

Colonies on Czapek agar growing restrictedly, attaining a diameter of 10 to 13 mm in 10 to 12 days at 25°C (Fig C-59), 10 to 14 mm at 30 C; about 3 mm at 37°C, (growing and slightly sporulating on NO_2-medium), typical velvety, smooth or radial furrowed, developing abundant conidial structures throughout the colony or in localized areas, non-sporulating or lightly sporulating areas colorless or typical yellow or pink aerial mycelium abundantly, with white or yellow shades margin about 0.5 to 1.0 mm wide, conidial areas in yellow to gray-green shades near Dark American Green, Empire Green, Artmesia Green, becoming simialr shades or Grayish Olive, exudate abundantly or limited, reddish to bright red in color, odor indistinct, reverse strongly reddish shades, with surrounding agar colored in lighter tints of the same shades, conidiophores arising from the substratum or sometimes from creeping or aerial hyphae, mostly 100 to 190μ, by 2.0 to 4.5μ, with apices somewhat enlarged up to 3.0 to 5.3μ, with smooth or nearly so walled, penicilli biverticillate and symmetrical (Fig M-59), usually consisting of a terminal verticil of 6 to 10 metulae, loosely compact, or divergent, mostly 8.3 to 12.5μ or 14.3μ by 2.0 to 4.0μ, sterigmata lanceolate with apices tapered in the manner characteristic of the group, loosely compact, in clusters of 5 to 8, mostly 10 to 12.5μ by 1.5 to 2.5μ, conidia elliptical, fusiform or ovate, mostly 2.5 to 3.7μ by 1.5 to 3.1μ, with smooth or nearly so walled, and the slightly rough walls are shown by electron micrscopy (Fig E-59), conidial chains loosely parallel or divergent, up to 40 to 100μ in length

Colonies on steep agar growing about 7 to 28 mm in 10 to 12 days at 25 C, 4 to 30 mm at 30 C, about 3 to 4 mm at 37°C, the other characters similar as on Czapek

Strains of this species isolated from soils and deteriorating materials

*Stoll, O Beitrage zur morphologischen und biologischen Charackteristik Penicilliumarten Wurzberg, p 35 Taf I, fig 7, Taf III, fig 3 Taf IV fig 4 1904

**Thom, C U S Dept Agr Bur Anim Ind, Bul 118 p 39., fig 7 1910 The Penicillia p 476 1930

***Raper, K B, Thom, C and Fennell D I A Manual of the Penicillia pp 637 639 1949

****Abe, S, J Gen Appl Microbiology 122 123 1956

60. *Penicillium aculeatum* Raper and Fennell



Fig. M-60. *Penicillium aculeatum* Raper and Fennell, FAT 810, detail of penicilli



Fig. E-60. *Penicillium aculeatum* Raper and Fennell, FAT 810, conidia showing the aculeate walls and the globose to subglobose form

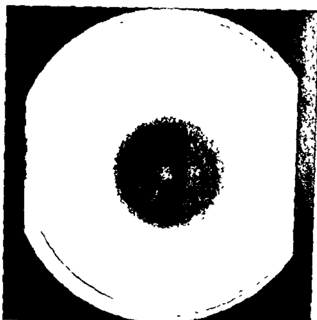


Fig. C-60. *Penicillium aculeatum* Raper and Fennell, FAT 810, on Czapek agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C にて5日目約 11 mm、10 日目約 45 mm、20 日目約 70 mm；30°C、10 日目約54 mm、37°C、10 日目約 11 mm，菌叢ビロード状，平滑，分生胞子無着生部にては黄又は桃色調菌糸が僅小あり，集落周縁部は白色又は黄，桃色調，巾約 2 0～2.5 mm，分生胞子着生部は黄緑色調，順次暗オリーブ色調を呈す；滲出物は僅小，赤色調 (Fig C-60)；集落裏面は赤色又は橙桃色，順次濃赤色調を呈し，集落周辺寒天は無色，順次淡桃色調に僅小着色，分生胞子柄は，基質又は菌糸帯より生育，90～320 μ×2 5～4 1 μ，頂端部幾分か膨大 4 0～43 μ，斑点状又は小顆粒状粗面ペニシラスは整斉輪生状 (Fig M-60)，梗基梗子は膨大状又は散開状様に 8～12 ヶ群生，10 6～13 8 μ×2 5～3 6 μ，斑点状粗面，梗子は緊密状様に 6～8 ヶ着生，9 3～12 5 μ×2 1～3 0 μ，槍形状で中間部幾分か膨大，分生胞子球形又は亜球形，2 1～3 1 μ，著しい大刺状，又は瘤状粗面，又電子顕微鏡写真 (Fig. E-60) にても針刺状粗面：分生胞子連鎖は並行状又は縺状様，長さ 30～60 μ

スティープ寒天培養に於ける集落の発育は 25°C にて5日目約 11 mm，10 日目約 46 mm，20 日目約 70 mm，30°C，10 日目約 46 mm，37°C 10 日目約 9 mm；他の諸特性は上記同一様，亜硝酸寒天培養にては僅小なる分生胞子着生をする程度の発育を示す。

本菌種は土壌又は腐敗物より分離さる。

60. *Penicillium aculeatum* Raper and Fennell

Colonies on Czapek agar growing rather rapidly, about 45 mm in 10 to 12 days at 25°C; about 54 mm at 30°C; about 11 mm at 37°C; (growing and slightly sporulating on NO_2-medium), typical velvety, smooth yellow or pink pigmented hyphae limitedly in non-sporulating areas, with growing margins about 2 0 to 2 5 mm wide, white to yellow or pink shades; conidial areas yellow green shades near Cerro Green, Dark American Green, becoming Dusky Olive Green; exudate limitedly, reddish shades (Fig C-60), odor almost lacking; reverse in typical reddish shades approximating Peach Red or Orange Pink, becoming Carmine

by 2.5 to 4 1 μ, with apices somewhat enlarged

walled, sterigmata loosely compact, in clusters of 6 to 8 mostly 9 3 to 12 5 μ by 2 1 to 3 0 μ, lanceolate and somewhat swollen; conidia globose to subglobose, mostly 2 1 to 3 1 μ with conspicuously typical echinulate or verruculose walled, and the aculeate walls are shown by electron microscopy (Fig E60), conidial chains loosely parallel or tangled, up to 30 to 60 μ in length

Colonies on steep agar growing about 46 mm in 10 to 12 days at 25 C, about 46 mm at 30 C; about 9 mm at 37 C, the other characters similar as on Czapek

Strains of this species isolated from the soils and deteriorating materials

*Raper, K B and Fennell D I, Mycologia, 40 535 538, fig 10, 1948

**Raper, K om, C and Fennell D I A Manual of the P 639 642 1949

61. *Penicillium purpurogenum* Stoll var. rubri-sclerotium Thom.

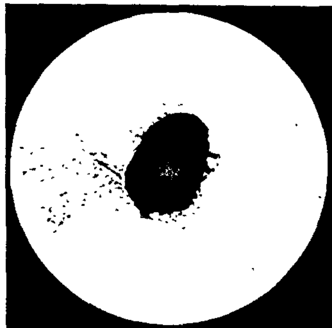


Fig. M-61 A. *Penicillium purpurogenum* Stoll var. rubri sclerotium Thom, FAT 1210, low power view of a single sclerotia.



Fig. M-61 B. *Penicillium purpurogenum* Stoll var rubri sclerotium Thom, FAT 1210, detail of a single penicillus.



Fig. E-61. *Penicillium purpurogenum* Stoll var. rubri sclerotium Thom, FAT 1210 conidia showing the slightly rough walls and the elliptical or fusiform form.

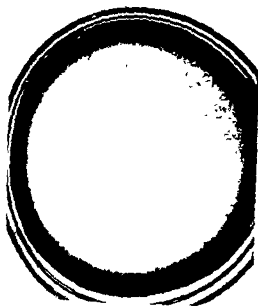


Fig. C-61 A. *Penicillium purpurogenum* Stoll var. rubri-sclerotium Thom, FAT 1210, on Czapek agar, 10 days

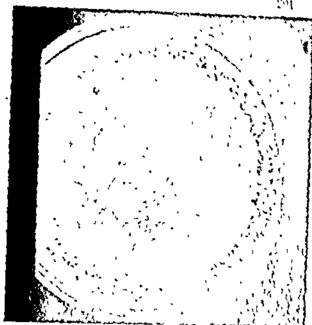


Fig. C-61 B.
scler
scler

ツアペック氏寒天培養に於ける集落の発育は 25°C にて5日目 16~33 mm，10日目 55~78 mm (Fig. C-61 A)，20日目 73~85 mm，30°C，10日目 55~74 mm，37°C 10日目 4~12 mm；平滑，菌叢はビロード状様又は僅小な縄状，又或る菌株にては明確な縄状，分生胞子層着生部にては白色又は淡黄色気菌糸僅小あり；集落周縁部は白色又は黄色調，巾 2.0~3.0 mm；分生胞子着生部は黄緑色又は青緑色調，順次同一様色調又は暗緑色を呈す，滲出物は豊富又は僅小，無色，又は淡黄色調，集落裏面は中心部にて赤色調，集落周辺部又は無色；分生胞子柄は基質より直立又時には気菌糸より生ず，80~200 μ~260 μ×2.5~4.1 μ，頂端部 3.7~4.6 μ，滑面又は小顆粒状粗面；ペニシラスは整斉輪生状 (Fig. M-61)，基底梗子は輪生状又は幾分か散開状に 6~12 ケ群生，9.3~15 μ×2.3~3.3 μ，頂端部 2.8~4.0 μ，斑点状粗面，梗子は並行状様に 4~7 ケ着生し，10~15 μ×1.8~3.1 μ，槍鋒状；分生胞子は楕円又は紡錘形，2.5~3.8 μ×1.5~3.1 μ，滑面，又電子顕微鏡写真 (Fig. E-61) にても 0.1 μ 以下の僅小粗面，分生胞子連鎖は並行状又は鎖状様，長さ 60~160 μ，或る菌株にては集落表面に培養約 3~4 週間目にて暗赤色又は赤色調の菌核を豊富に形成，亜球形，又は楕円形，150~360 μ×120~300 μ (Fig. C-61 B)。

スティープ氏寒天培養にての集落の発育は 25°C にて5日目 20~38 mm，10日目 66~79 mm，20日目 73~85 mm，30°C 10日目 60~80 mm；37°C 4~15 mm，他の諸特性は上記同一様。

亜硝酸又天培養にては僅小な分生胞子を形成する程度の発育を示す。

本菌種は土壌又は森林より屡々分離される。

61. *Pen*
scler

Colo
attaining
days at
at 37°C,
on NO
funiculo
white or p
in nonsporulating
about 2.0 to 3.0 mm wide, white or yellow shades

as on Czapek

Strains of this species isolated from soils and forests

*Thom, C., Mycologia 7, 141-142, fig. 1, 1915; The Penicillia, p. 473, 1930

**Raper, K. B. C. and Fennell, D. I., A Manual of the Pen 36-437, 1949

***Abe, S., J. Microbiology, 127, 1956

62. *Penicillium rugulosum* Thom



Fig. M-62. *Penicillium rugulosum* Thom, FAT 322, detail of a single penicillus



Fig. E-62. *Penicillium rugulosum* Thom, FAT 322, conidia showing the tuberculate or verruculose walls and the elliptical or ovate form

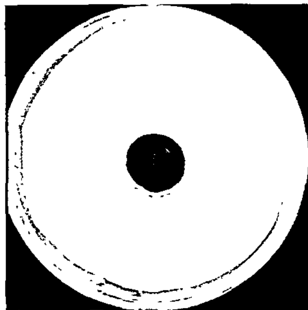


Fig C-62. *Penicillium rugulosum* Thom, FAT 322, on Czapek agar, 10 days

ノアペック寒天培養における集落の発育は25°Cにて5日目 6~11 mm, 10日目 21~22 mm, (Fig C-62), 20日目 40~42 mm, 30°C, 10日目 21~23 mm, 37°C 発育不能，集落は平滑又は放射状の皺を有し，菌叢はビロード状，集落周囲部は白色，0 5~1 0 mm，巾，中心部又は部分的に黄色又は橙褐色調の菌糸が緻密に密着す，分生胞子着生部は暗濃黄緑色調；滲出物は欠又は僅少，褐色調，集落裏面は部分的に又は全面，橙褐色，橙赤，橙褐色調，又時には中心部オリーブ緑色を呈す，集落周辺寒天は無色，順次淡黄色調；分生胞子柄は基底菌糸帯より生育し，時には分枝す，120~190 μ×2 3~3 0 μ，頂端部は幾分か膨大し，3 4~4 4 μ，滑面，ペニシラスは整斉輪生状 (Fig M-62) 基底梗子は緻密状様に或は幾分か散開状に 4~7 ヶ群生し，9 3~12 3 μ×2 1~2 8 μ，頂端部は 2 5~2 8 μ；梗子は並行状様に 4~5 ヶ着生，8 1~11 2 μ×1 8~2 4 μ，先端が尖っている，分生胞子は楕円又は卵形，2 5~3 7 μ×1 8~2 8 μ，大刺状又は疣状粗面，又電子顕微鏡写真 (Fig E-62) にても同一様，分生胞子連鎖は縺状又は散開状，長さ 60~90 μ

ステイープ寒天培養における集落の発育は25 C にて5日目 7~12 mm, 10 日目 23~27 mm, 20 日目 40~43 mm, 30 C 10 日目 21~22 mm, 37°C 発育不能，他の諸特性は上記同一様，亜硝酸寒天培養にてはノアペック寒天同様発育良好

本菌株は土壌より分離さる

62. *Penicillium rugulosum* Thom

Colonies on Czapek agar growing restrictedly, attaining a diameter of 21 to 22 mm. in 10 to 12 days at 25°C (Fig C-62); 21 to 23 mm at 30°C, seldom growing at 37 C (growing very well on NO_2-medium); smooth or radial furrowed, typically velvety, with growing margin about 0 5 to 1 0 mm wide, white, compact admixture of sterile encrusted yellow or orange brown shades vegetative hyphae in central or localized areas; conidial areas in dark yellow-green shades near Dusky Yellowish Green, becoming Dusky Dull Green; exudate lacking or limitedly, brownish color; odor indistinct, reverse typical vinaceous or orange red, and orange-brown shades either in localized areas or throughout, and sometimes olive green shades in central areas, with surrounding agar colorless, becoming pale yellow shades; conidiophores arising from the basal felt, sometimes branched, mostly 120 to 190 μ by 2 3 to 3 0 μ, with apices somewhat enlarged up to 3 4 to 4 4 μ in diameter, with smooth or nearly so walled; penicilli biverticillate and symmetrical (Fig M-62); metulae loosely compact or somewhat divergent, 4 to 7 in the verticil, commonly 9 3 to 12 3 μ by 2 1 to 2 8 μ, apices about 2 5 to 2 8 μ; sterigmata closely parallel, in clusters of 4 to 5, 8 1 to 11 2 μ by 1 8 to 2 4 μ, acuminate, conidia elliptical or ovate, mostly 2 5 to 3 7 μ by 1 8 to 2 8 μ, with echinulate or verruculose walled, and the similar walls are shown by electron microscopy (Fig E-62), conidial chains loosely tangled or divergent, up to 60 to 90 μ in length

Colonies on steep agar growing about 23 to 27 mm in 10 to 12 days at 25°C, 21 to 22 mm at 30 C, seldom growing at 37 C, the other characters similar as on Czapek

Strains of this species isolated from soils

*Thom, C, U S Dept Agr, Bur Anim Ind Bul 118, pp 60 61 fig 21 1910 The Penicillia, pp 472 474 figs 80 and 81 1930

**Raper, K B, Thom C and Fennell D I, A Manual of the Penicillia, pp 646 650 1949

***Abe, S J Gen Appl Microbiology 126 127 1956



63. *Penicillium concavo-rugulosum* Abe.



Fig. M-63. *Penicillium concavo-rugulosum* Abe, FAT 672, detail of penicilli.

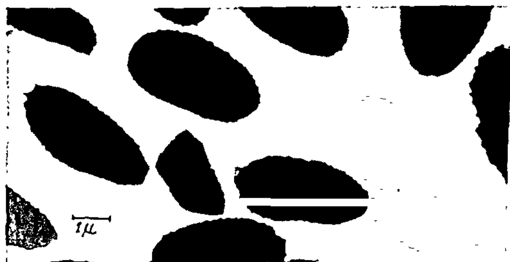


Fig. [illegible]-63. *Penicillium concavo-rugulosum* Abe, FAT 672, conidia showing the slightly rough walls and the long elliptical form.

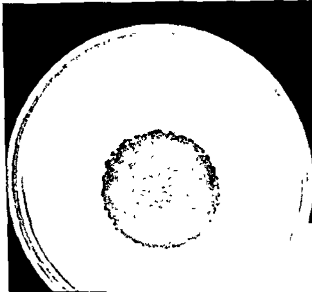


Fig C-63. *Penicillium concavo rugulosum* Abe, FAT 744, on Czapek agar, 10 days.

ツァペック寒天培養に於ける集落の発育は25°Cにて5日目8～16 mm，10日目27～37 mm，20日目52～63 mm；30 C° 10日目27～38 mm；37 C°発育不能；集落は分生胞子構成体をもった比較的薄い基礎菌糸帯を有し，常に菌叢はビロード状，時には黄色調菌糸を有し，集落円周部は淡黄色，巾0 5～1.3 mm；分生胞子着生部は鮮黄緑色又は暗黄緑色調，順次くすんだ黄緑色調を呈す；滲出物は欠又は僅小，淡橙色；集落裏面は橙，橙赤，橙褐色調に部分的に又全面呈色，集落周辺寒天は約3週間目にても無着色，分生胞子は基質又は基礎菌糸帯より生育し，60～250 μ～320 μ×2 5～3 8 μ，滑面，頂端部3 1～5 0 μ；ペニシラスは整齊輪生状，(Fig M-63) 各々4～6ヶの梗子を伴った基底梗子は緻密状様に又幾分か散開状に4～8群生す；基底梗子は10 6～17.5 μ×2 3～3 5 μ，梗子は並行状に着生，11～14 μ×1.8～2 7 μ；分生胞子は長楕円形，3 1～4 3 μ×2 1～3 0 μ，滑面又は僅小粗面，又電子顕微鏡写真 (Fig E-63) にても0 1 μ以下の僅小粗面，分生胞子連鎖は並行状様に，鎖状，長さ60～250 μ

ステイープ寒天培養に於ける集落の発育は25°Cにて5日目10～17 mm，10日目30～42 mm，20日目60～70 mm；30°C 10日目30～43 mm，37°C発育不能，他の諸特性は上記同一様，亜硝酸寒天培養にてはツァペック寒天同様の良好なる発育を示す。

本菌種は土壌又は病変米より分離さる

63. *Penicillium concavo-rugulosum Abe.*

Colonies on Czapek agar growing rather restrictedly, attaining a diameter of 27 to 37 mm in 10 to 12 days at 25°C; (Fig C-63) 27 to 38 mm at 30°C; seldom growing at 37°C; (growing very well on NO_2-medium); consisting of a comparatively thin basal felt bearing crowded conidial structures, usually typically velvety, sometimes with yellow encrusted vegetative hyphae, a pale yellow margin 0 5 to 1.3 mm wide, conidial areas in bright yellow green or dark yellow green shades near Lincoln Green, Pois Green, Cedar Green, Empire Green, becoming dull yellow green shades near Andover Green or Tea Green, exudate lacking or limited, light orange, odor almost lacking or indistinct, moldy; reverse in orange, orange-red or orange-brown, either localized or throughout, with surrounding agar seldom pigmented in about 3 weeks; conidiophores arising primarily from the substratum or basal felt, mostly up to 60 to 250 μ or 320 μ by 2 5 to 3 8 μ, with walls smooth or nearly so, apices to 3 1 to 5 0 μ in diameter; penicilli typically biverticillate and symmetrical, (Fig M-63) usually consisting of single verticils of 4 to 8 loosely compact or somewhat divergent metulae, each termiating in verticils of 4 to 6 sterigmata, metulae mostly 10 6 to 17 5 μ by 2 3 to 3 5 μ; sterigmata closely parallel, mostly 11 to 14 μ by 1 8 to 2 7 μ, conidia typical long elliptical, mostly 3 1 to 4.3 μ by 2 1 to 3 0 μ, with smooth or slightly rough walled, and the slightly rough walls are shown by electron microscopy (Fig E-63), conidial chains loosely parallel or tangled, up to 60 to 250 μ in length

Colonies on steep agar growing rather restricted, about 30 to 42 mm in 10 to 12 days at 25 C, 30 to 43 mm at 30 C, seldom growing at 37 C, the other characters similar as on Czapek

Strains of this species isolated from soils and diseased rice

*Abe, S, Gen Appl Microbiology, 127 123, 1956

64. *Penicillium tardum* Thom



Fig. M-64 A. *Penicillium tardum* Thom, FAT 923, low power view of colony section showing typically velvety character of texture.



Fig. M-64 B. *Penicillium tardum* Thom, FAT 922, detail of penicilli



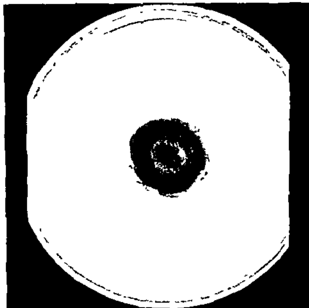


Fig C-64. *Penicillium tardum* Thom, FAT 922, on Czapek agar, 10 days

ツアペック寒天培養における集落の発育は 25 C にて5日目 9〜11 mm、10日目 20〜35 mm、20日目 50〜65 mm、30°C、10日目 20〜38 mm；37°C 発育不能；菌叢はビロード状又は類似、集落は中心部が隆起し、分生胞子無着生部には黄色菌糸豊富で、波状の輪紋状を呈す。集落円周縁は黄色、10〜20 mm 巾、分生胞子着生部は暗黄緑色又は灰緑色調、滲出物は欠；集落裏面は無色又は輝黄色調、集落周辺寒天は無色又は順次淡黄色調に着色；分生胞子柄は基質又は気菌糸より生育、60〜300 μ×2.3〜38 μ、頂端稍膨、31〜49 μ、滑面；ペニシラスは整斉輪生状 (Fig M-64)、時々断片的、基底梗子は稍密状様に又幾分か散開状様に 5〜8ヶ群生、93〜150 μ×21〜34 μ；梗子は並行状様に4〜8ヶ着生、93〜145 μ×20〜30 μ、槍針状；分生胞子は長楕円形、28〜44 μ×17〜25 μ、滑面、電子顕微鏡写真 (Fig E 64) にては 01 μ 以下の微小粗面、分生胞子連鎖は縺状又は散開型様、長さ 60〜190 μ

スティープ寒天培養における集落の発育は 25 C にて 5日目 9〜11 mm、10日目 21〜31 mm 20日目 58〜70 mm、30 C、10日目 24〜32 mm、37 C 発育不能、他の諸特性は上記同一様

亜硝酸寒天培養に於てはツアペック寒天同様の良好なる発育を示す

本菌種は土壌又は腐敗物より分離さる

64 *Penicillium tardum* Thom

Colonies on Czapek agar growing rather restrictedly, attaining a diameter of 20 to 35 mm. in 10 to 12 days at 25°C, 20 to 38 mm at 30°C, seldom growing at 37°C, (growing very well on NO_2-medium), velvety or velutinous, usually elevated central areas, yellow mycelium abundantly in non sporulating areas and wave-zonated, with yellow margin about 10 to 20 mm wide (Fig C-64); conidial areas in dark yellow green or gray green shades near Tea Green, Andover Green, Dusky Yellowish Green, Javal Green, exudate lacking, odor limited or indistinct; reverse colorless or bright yellow shades, with surrounding agar colorless or becoming pale yellow shades pigmented, conidiophores arising either from the substratum or from aerial hyphae, varibale in length, commonly 60 to 300 μ by 23 to 38 μ, with apices somewhat enlarged up to 31 to 49 μ, with smooth or nearly so walled, penicilli typically biverticillate symmetrical but often fractional (Fig M-64); metulae in verticils of 5 to 8, loosely compact or some what divergent, mostly 93 to 150 μ by 21 to 34 μ, sterigmata closely parallel, in clusters of 4 to 6 or 8, mostly 9.3 to 145 μ by 20 to 30 μ, lanceolate, conidia long elliptical, mostly 28 to 44 μ by 17 to 25 μ, with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-64), conidial chains loosely tangled or divergent up to 60 to 190 μ in length

Colonies on steep agar growing rather restrictedly, about 21 to 31 mm in 10 to 12 days at 25 C, about 24 to 32 mm at 30 mm at 30 C, seldom growing at 37 C, the other characters as on Czapek

Strains of this species isolated from soils and deteriorating materials

* Thom, C.: The Penicillia pp. 485-487, fig. 84, 1930

* Raper, K. B., Thom, C. and Fennell, D. I.: A Manual of the Penicillia pp. 651-653, 1949

** [illegible] Appl Microbiology 125-129 1956

65. *Penicillium diversum* Raper and Fennell

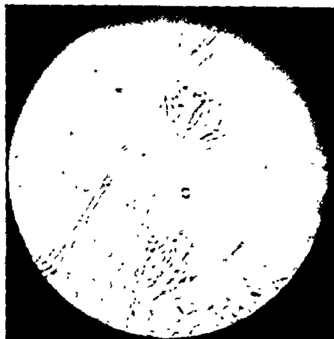


Fig. M-65 A. *Penicillium divaricatum* Raper and Fennell, FAT 1291, detail of the penicilli.

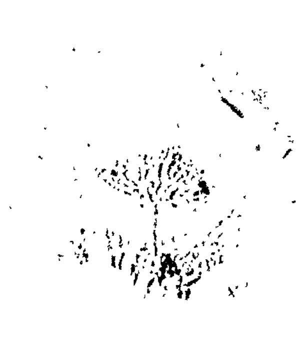


Fig. M-65 B. *Penicillium divaricatum* var. aureum Raper and Fennell, FAT 1295, detail of a single penicillus.

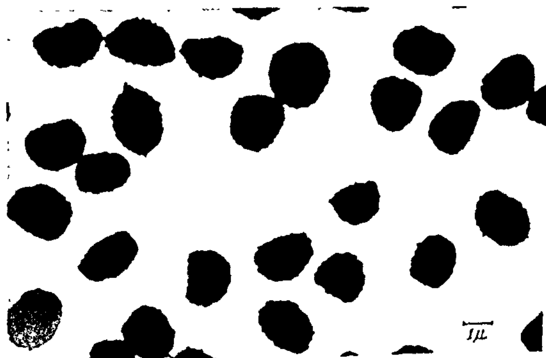


Fig. E-65. *Penicillium divaricatum* Raper and Fennell, FAT 1291, conidia showing the slightly rough walls and the elliptical or subglobose form.

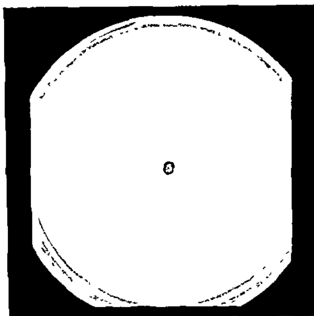


Fig. C-65. *Penicillium diversum* Rapar and Fennell, FAT 1394, 10 days

ツァペック寒天培養に於ける集落の発育は特長的に遅く、25°C, 5日目約 3 mm, 10日目約 4 mm, 20日目約 5 mm; 30°C 10日目約 3 mm; 37°C 発育不能; 集落は硬い菌糸帯を有し、菌叢はビロード状で、僅小な顆粒状, 集落円周部は白色, 約 0 2 mm 巾, 平滑 (Fig C 65); 分生胞子着生部は黄緑色, 又は暗オリーブ緑色調; 滲出物は欠; 集落裏面は無色; 分生胞子柄は菌糸帯より生育し, 120~200 μ×2 5~3 4 μ, 頂端部 3 0~4 5 μ, 滑面, ペニシラスは整斉輪生状(Fig M-65), 基底梗子は緻密状様に又幾分か散開状に 5~7 ケ群生し, 7 5~12 5 μ×2 1~3 1 μ, 梗子は並行状様に 5~6 ケ着生, 8 7~10 μ×1 5~2 2 μ, 槍鉾状; 分生胞子は楕円又は亜球形, 1 8~2 6 μ×1 5~1 9 μ, 滑面, 又電子顕微鏡写真 (Fig E-65) にては 0 1 μ 以下の僅小粗面, 分生胞子連鎖は紛状, 長さ, 70~120 μ

ステイープ寒天培養に於ける集落の発育はツァペック寒天同一様で, 25°C 5日目約 3 mm, 10日目約 5 mm, 20日目約 6 mm, 30°C, 約 4 mm, 37°C 発育不能, 他の諸特性は上記同一様。

亜硝酸寒天培養にてはツァペック寒天同様の発育を示す。

本菌種は土壌より分離さる。

65 *Penicillium diversum* Raper and Fennell

Colonies on Czapek agar growing extremely slow-growing, about 4 mm in 10 to 12 days at 25°C; about 3 mm at 30°C; seldom growing at 37°C, (growing very well on NO_2-medum), consisting of a fairly tough mycelial felt, surface appearing velvety or slightly granular, with white margin about 0 2 mm. wide, smooth, conidial areas in yellow green shades near *Dark Greenish Olive*, becoming Dark Ivy Green, exudate lacking; odor suggesting see-weed; reverse uncolored (Fig. C-65), conidiophores arising from the mycelial felt, up to 120 to 200 μ by 2.5 to 3 4 μ, with apices somewhat enlarged to 3 0 to 4 5 μ, with smooth or nearly so walled, penicilli typically biverticillate and symmetrical (Fig M 65); metulae loosely compact or somewhat divergent, in verticils 5 to 7, mostly 7 5 to 12 5 μ by 2 1 to 3 1 μ, sterigmata closely parallel, in clusters of 5 to 6, mostly 8 7 to 10 μ by 1 5 to 2 2 μ, lanceolate; conidia elliptical or subglobose, mostly 1 8 to 2 6 μ by 1 5 to 1 9 μ with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-65), conidial chains tangled, up to 70 to 120 μ in length

Colonies on steep agar growing very restrictedly, about 5 mm in 10 to 12 days at 25°C, about 4 mm at 30 C; sledom growing at 37 C, the other characters as on Czapek

Strains of this species isolated from soils

*Raper, K B and Fennell, D I, Mycologia, 40 537 541, fig 11 1918

**Raper, K B, Thom, C and Fennell D I, A Manual of the Penicillia, pp 653 655 1949.

66. *Penicillium herquei* Bainier and Sartory



Fig. M-66 A. *Penicillium kerquei* Bainier and Sartory, FAT 958, low power view of colony section showing typically velvety character of texture



Fig. M-66 B. *Penicillium kerquei* Bainier and Sartory, FAT 958, detail of penicilli

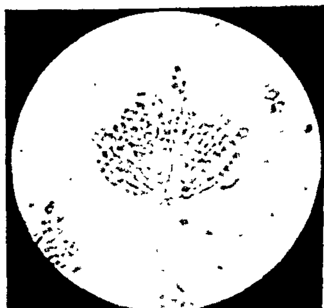


Fig. M-66 C. *Penicillium kerquei* Bainier and Sartory, FAT 958, detail of a single penicillus

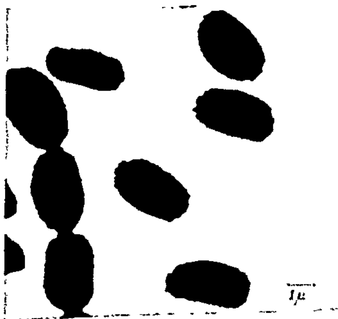


Fig. T-66. *Penicillium kerquei* Bainier and Sartory, FAT 958, conidia showing the slightly rough walls and the [illegible]

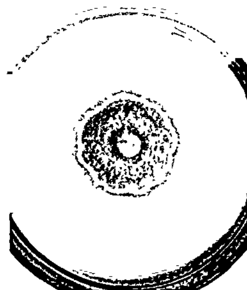


Fig. C-66. *Penicillium herquei* Bainier and Sartory, FAT 958, 10 days

ツァペック寒天培養に於ける集落の発育は 25 C にて5日目 8~13 mm, 10 日目 17~43 mm, 20 日目 28~64 mm; 30°C 10 日目 17~43 mm; 37°C 発育不能; 菌叢はビロード状又は類似, 又或る菌株にては僅小の又は明確な綿毛状, 平滑又は放射状様皺を有し, 分生胞子無着生部には黄色菌糸豊富, 集落周縁部は黄色, 巾 0 2~2 0 mm (Fig C-66) 分生胞子着生部は鮮黄緑色又は暗黄緑色調, 順次同一色調又はくすんだ暗緑色調を呈す, 滲出物は欠又は僅小, 黄緑色; 集落裏面は部分的に又は全面に鮮緑色, 黒緑色, 又はオリーブ褐色調, 集落周辺寒天は淡緑色, オリーブ褐色, 又はくすんだ黄色調; 分生胞子柄は菌糸帯より又は基質より生育し, 60~280 μ×2.5~5 3 μ, 頂端部は 3 1~6 7 μ, 顆粒状又は斑点状粗面; ペニシラスは比較的短く, 常に梗子を着生する基底梗子の群生を有す (Fig M-66); 基底梗子は散開型に 4~10 ケ群生, 7 5~15 6 μ ×2 3~5 0 μ; 頂端部は 3 1~6 0 μ, 梗子は稍密状様に又幾分か散開状に 3~9 ケ着生, 8 7~14 4 μ×1 8~4 0 μ 恰も細い嘴様で, 急激に細い, 分生胞子は長楕円又はラグビーボール形 2 8~4 4 μ×1 8~3 0 μ, 滑面, 電子顕微鏡写真 (Fig E-66) にても 0 1 μ 以下の僅小粗面, 分生胞子連鎖は鎖状又は平行状様, 長さ 30~160 μ.

ステイープ寒天培養にては 25 C 5 日目 10~25 mm 10 日目 22~60 mm 20 日目 38~74 mm, 30 C 10 日目 24~60 mm, 37 C 発育不能, 他の諸特性は上記同様

亜硝酸寒天培養にてはツァペック寒天同様に発育良好

本菌株は土壌又は腐敗物より分離される

66 *Penicillium herquei* Bainier and Sartory

Colonies on Czapek agar growing rather restrictedly, attaining a diameter of 17 to 43 mm. in 10 to 12 days at 25 C; 17 to 43 mm at 30 C; seldom growing at 37 C, (growing very well on NO_2-medium); velvety or velutinous, some strains subfloccose or floccose, smooth or loosely radial furrowed, yellowish mycelium abundantly in steril areas, with typical yellowish margin about 0 2 to 2 0 mm wide (Fig. C-60), conidial areas bright to dark yellow green shades near Crass Green, Kronberg's Green Dusky Olive Green, Frence Green, Dusky Yellowish Green, becoming similar shades or Andover Green, exduate lacking or limitedly, yellow green color, oder sometimes lacking or indefinite but usually strong, variable, often suggesting black walnuts, occasionally apples, or in some strains spicy, reverse in bright green, blackish green or olive brown colors in localized or throughout, with surrounding agar pale green, olivish brown or dull yellow shades, conidiophores arising from the felt or directly from the substratum, commonly 60 to 280 μ by 2 5 to 5 3 μ, with apices somewhat enlarged up to 3 1 to 6 7 μ, with granular or punctate walled; penicilli comparatively short, regularly consisting of a terminal verticil of metulae bearing clusters of sterigmata (Fig M-66), metulae usually in verticils of 4 to 10, suggestive divaricate, commonly 7.5 to 15 6 μ by 2 3 to 5 0 μ, apices 3 1 to 6 0 μ, sterigmata loosely compact or somewhat divergent, in clusters of 3 to 9, commonly 8 7 to 14 4 μ by 1.8 to 4 0 μ, tapered abruptly to narrow beak like conidial tubes; conidia long elliptical or Ragby ball form, mostly 2 8 to 4 4 μ by 1.8 to 3 0 μ, with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-66), conidial chains tangled or loosely parallel, up to 30 to 160 μ in length

Colonies on steep agar growing more rapidly, 22 to 60 mm in 10 to 12 days at 25 C, 24 to 60 mm at 30 C, seldom growing at 37 C, the other characters similar as on Czapek

Strains of this species isolated from soils and deteriorating materials

*Bainier G and Sartory A Bul Soc Mycol France 28 121 126 Pl VII figs 1 to 1912

**Thom C The Penicillia pp 467 469 fig 78 1930

***Raper K B Thom C and Fennel D I A Manual of the Penicillia pp 653 664 1949

****Abe S J Gen Appl Microbiology 129 130 1956

67. *Penicillium novae-zeelandiae* van Beyma

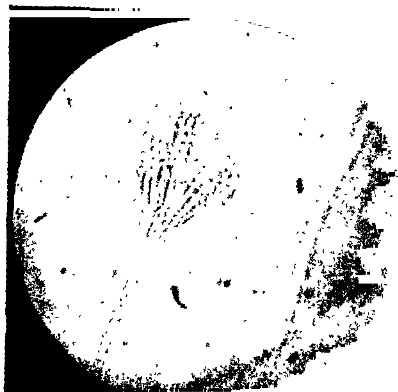


Fig. M-67. *Penicillium novae zeelandiae* van Beyma, FAT 1296, detail of a single penicillus



Fig. E-67. *Penicillium novae zeelandiae* van Beyma, FAT 1296 conidia showing the slightly rough walls and the globose to subglobose form

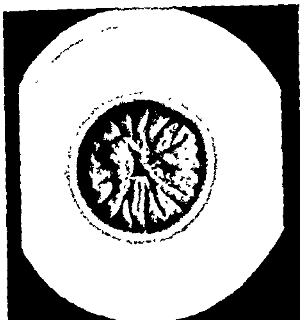


Fig C-67. *Penicillium novae zeelandiae* van Beyma, FAT 1296, on Czapek agar, 10 days.

ノアヘック寒天培養に於ける集落の発育は 25°C にて5日目約 20 mm, 10 日目約 35 mm, 20 日目約 70 mm; 30°C 10 日目約 36 mm, 37°C 発育不能。菌叢ビロード状, 放射状様の皺を有し, 集落円周部は白色, 約 1.5 mm 巾; 分生胞子密生部はくすんだ緑色, 又は灰緑色調, 順次灰オリーブ色調を呈す; 滲出物は欠又は僅小, 黄褐色調; 集落裏面中心部は暗緑色又は黒色調, 円周部近くは黄色, 橙, 桃色調; 集落周辺寒天はくすんだ黄又は桃色調 (Fig C-67), 或る菌株にては中心部に黒色菌核を豊富に作り, 又屡々, 僅少の菌糸に包まれた菌核がセクター (扇状) 部に又は不規則な部分に出来る, 菌核の形は不均一で, 長楕円又は楕円形で, 基質の表面に発育し放射状線に沿って長軸を位置している; 分生胞子柄は基質又は基礎菌糸帯より生育し, 60~240 μ×3.0~3.8 μ, 頂端部 3.5~4.3 μ, 顆粒状粗面; ペニシラスは整斉輪生状 (Fig M-67), 梗基梗子は粗密状様に又は散開状に 4~6 ケ群生し, 10~11.9 μ×2.8~3.7 μ, 梗子は粗密状様に 3~6 ケ密生し, 10~11.2 μ×1.7~2.5 μ 槍針状, 分生胞子は球形又は亜球形, 1.8~2.6 μ, 滑面, 又は電子顕微鏡写真 (Fig E-67) にては 0.1 μ 以下の僅小粗面, 分生胞子連鎖は散開状又は並行状様, 長さ 10~40 μ

ステイープ寒天培養に於ける集落の発育は5日目約 27 mm, 10 日目約 52 mm 20 日目約 75 mm, 30 C 10 日目約 51 mm、37 C 発育不能, 他の諸性質は上記同一様。

亜硝酸寒天培養 ではノアヘック寒天同様の発育を示す。

本菌種は土壌より分離される

67. *Penicillium novae-zee[...]*

Colonies on Czapek agar [...] strictedly, attaining a diam[...] in 10 to 12 days at 25 C, ab[...] 36 m[...] seldom growing at 37°C; (growing [...] NO_2-medium); velutinous, loosely radia[...] with white margin about 1.5 mm wid[...] areas in dull green shades near Andover [...] or Pea Green, becoming Grayish Olive, exudat[...] lacking or limited, clear; odor lacking, reverse in dark greenish to black shades in central areas and dull to fairly bright yellow, orange or pink shades in marginal areas; with surrounding agar dull yellow or pinkish shades (Fig C-67), some strains producing abundant black sclerotia in central areas, occasionally showing sectors or irregular areas with abundant sclerotia accompanied by a reduced or limited mycelial development, sclerotia very irregular in form, usually elongate or elliptical, often confluent, with long axes oriented along radial lines usually developing in the surface of the substratum, conidiophores arising from the substratum or basal felt, mostly 60 to 240 μ by 3.0 to 3.8 μ, with apices somewhat enlarged up to 3.5 to 4.3 μ, with granular walled; penicilli symmetrical and biverticillate (Fig M-67), metulae loosely compact or divergent, 4 to 6 in the verticil, mostly 10 to 11.9 μ by 2.8 to 3.7 μ, sterigmata loosely compact, in clusters of 3 to 6, mostly 10 to 11.2 μ by 1.7 to 2.5 μ, lanceolate-like conidia globose or subglobose, mostly 1.8 to 2.6 μ, with smooth or nearly so walled, and the slightly rough walls are shown by electron microscopy (Fig E-67), conidial chains divergent or loosely parallel, up to 10 to 40 μ or more in length

Colonies on steep agar growing rather rapidly, about 52 mm in 10 to 12 days at 25 C, about 51 mm at 30 C, seldom growing at 37 C, the other characters as on Czapek

Strains of this species isolated from soils.

*van Beyma F H Antonie van Leeuwenhoek 6, 273 275, fig 7 1939 1940

**Raper, K. B., Thom C and Fennell D I A Manual of the [...] pp 643 667 1949



Fig. M-67. *Penicillium novae zeelandiae* van Beyma, FAT 1296, detail of a single penicillus



Fig. L-67. *Penicillium novae zeelandiae* van Beyma, FAT 1296, conidia showing the slightly rough walls and the globose or subglobose form

68. *Penicillium albicans* Bainier

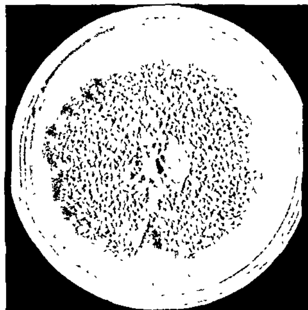


Fig. C-68. *Penicillium albicans* Bainier, FAT 1316, on Steep agar, 10 days

ツァペック寒天培養に於ける集落の発育は 25°C にて5日目約 15mm; 10 日目約 40mm, 20 日目約 55mm; 30°C 日目約 30mm, 37°C 発育不能; 粗雑なる発育を示し，大変薄く，栄養菌糸は僅小で且つ殆んとが基底菌糸のみで，無色，僅小なる分生胞子の着生を示すに過ぎぬ。

ステープ寒天培養に於ける集落の発育は良好にて，25°C 5 日目約 20mm, 10 日目約 63mm (Fig C-68), 20 日目約 75mm, 30°C 10 日目 35mm; 37°C 発育不能; 菌叢は僅小な縄状，集落平滑又は放射状の皺を有す，集落円周部は白色，約 3mm 巾，分生胞子着生は豊富，分生胞子着生部は最初白色から淡クリーム色，順次同様色調又は淡桃色調; 滲出物は欠，集落裏面は淡褐色乃至褐色調，集落周辺寒天は無色; 分生胞子柄は気菌糸又はロープ状菌糸より生育し，20~60~100 μ×3 0~5 3 μ，頂端部は 3 7~6 3 μ，滑面，ペニシラスはサイズ及様相が各種で，梗子の下部は 3~4 回分枝するか，整斉状で，各微細構成部は緻密状に密接した形状を示す。分枝は各種サイズを示し，7.5~25 μ×2 8~5 0 μ，頂端部は 3 0~5 6 μ，基底梗子は緻密状に 3~5 ヶ群生，7.5~18 7 μ×2 4~3 5 μ，梗子は緻密状様に 3~5 ヶ着生し，7.5~12.5 又は 18 μ×2 1~3 0 μ，先端部は幾分か細い; 分生胞子は両端部が幾分か平たい楕円形，4 6~9 3 μ×2 1~3 7 μ，滑面，電子顕微鏡写真 (Fig E-68) にても滑面，分生胞子連鎖は散開状で，長さ 30~120 μ

亜硝酸寒天培養には発育不能。

本菌は土壌又は変質濾紙より分離さる。

68. *Penicillium albicans* Bainier

Colonies on Czapek agar growing somewhat broadly, attaining a diameter of about 40 mm in 10 to 12 days at 25°C, about 30 mm at 30°C, seldom growing at 37°C; (growing little or not on NO_2 medium); but growing very sparsely, very wholly with vegetative mycelium limited and almost submerged, uncolor, lightly sporulating throughout

Colonies on steep agar fairly luxuriant, attaining a diameter of about 63 mm, in 10 to 12 days at 25°C, about 35 mm at 30°C; seldom growing at 37°C, slightly funiculose, smooth or radial furrowed, with white margin about 3 mm. wide heavily sporing throughout, conidial areas at first white to light cream, becoming light buff or pale pinkish shades, odor lacking; exudate not produced, reverse in deep tan to light brown shades, with surrounding agar colorless, conidiophores arising from aerial hyphae and ropes of hyphae, variable in length, mostly 20 to 60 or 100 μ by 3 0 to 5 3 μ, with apices somewhat enlarged up to 3 7 to 6 3 μ, with smooth or nearly so walled; penicilli variable in size and pattern, commonly very large and 3 or 4 times branched below the sterigmata, often but not consistently symmetrical, with cellular elements closely appreassed to form a very compact fruiting head (Fig M-68), branches variable in form and size, mostly 7 5 to 25 μ by by 2 8 to 5 0 μ, with apices about 3 0 to 5 6 μ, metulae closely compact, 3 to 5 in the verticil, mostly 7 5 to 18 7 μ by 2 4 to 3 5 μ, sterigmata closely compact, in clusters of 3 to 5, mostly 7.5 to 12 5 or 18 μ by 2 1 to 3 0 μ with conidium bearing tips somewhat narrowed, conidia strongly elliptical with basal ends somewhat flattened, 4 6 to 9 3 μ by 2 1 to 3 7 μ, with smooth or nearly so walled, and the smooth or nearly so walls are shwon by electron microscopy (Fig E-68), conidial chains loosely divergent, up to 30 to 120 in length

Strains of this species isolated from soils and filter paper

*Bainier, G, Bul Soc Myc France 23 18, P 1 V, figs 8 and 9 1907
**Thom C, The Penicillia, p 495 fig 87 1930
***Raper, K B, Thom, C and Fennell D I, A Manual of the penicillia, pp 669 672 1949
****Tubaki, K Nago 4 p 23 1954
*****Abe, S, J Gen Appl Microbiology 133 1956

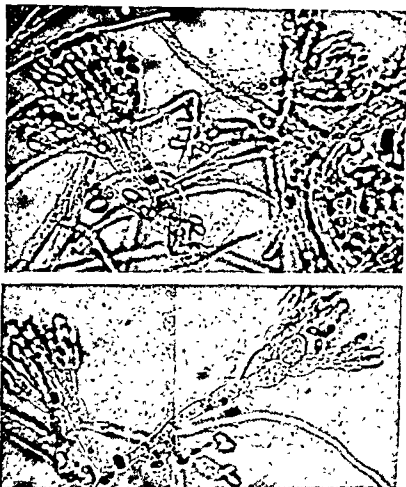


Fig. M-68. *Penicillium albicans* Bainier, FAT 1316, detail of penicilli



Fig. E-68. *[illegible]* FAT 1316 [illegible] showing the [illegible] walls and the [illegible] with basal ends somewhat flattened

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(The former numbers show the pages and the latter show [illegible])

Index to the Name of [illegible]